THE
Malayan Agricultural Journal

DECEMBER, 1930.

EDITORIAL.

Padi Estates. The pages of the *Malayan Agricultural* Journal have frequently been used to record different aspects of padi cultivation and it may perhaps be thought that undue emphasis has been laid on a crop considered more suited to cultivation on a small scale and therefore not of particular interest to the majority of the readers of this Journal. The reason for the public indifference to padi cultivation has, we suspect, been mainly because the crop does not appear to offer any promise of substantial profits. The position has of late been somewhat clarified, and two important points emerge. Firstly, the population of Malaya cannot stand aloof from the importance of maintaining an adequate food supply for the imported labour; and secondly, the employment of capital in the cultivation of padi on a large scale is daily entering more surely into the sphere of practical planting politics.

In the past this Department has given considerable attention to the improvement of varieties of padi and the control of pests and diseases of the crop: this experience will be of considerable value when the time comes—as we think it will—for a more general appreciation of the value of padi as a crop for cultivation on a large scale.

In a previous article appearing in this Journal, attention was drawn to the successful cultivation of padi on a large scale in Australia and it was pointed out editorially that a similar system has been established in certain other countries. In an article which appears in this number under the title of "Mechanised Rice Cultivation in Southern Siam", the argument in favour of large scale padi cultivation is brought a step nearer home. The successful enterprise of a Penang Chinese family in establishing a rice plantation in South Siam is particularly noteworthy. The argument that this crop is more suited to cultivation by Asiatics than by Europeans is refuted by the fact that these pioneers achieved success, not by their innate knowledge of the crop, but by the adoption of western methods of cultivation.

The Future of Coconuts. The ever-increasing demand for vegetable oils will lead those concerned in production to consider possible future developments in the cultivation of coconuts. The present set-back in prices is no indication of future demand and it is pro-

bable that copra will for many years be able to compete with other edible vegetable oils. But in order that the industry may be in this favourable position it is essential that the cost of production be materially reduced, and this to our mind can best be effected by the elimination of poor yielding trees. Amongst other factors that require reviewing are drainage and the possible abandonment of unsuitable areas.

It appears to have been the practice in the past to regard all coastal areas as suitable for coconut cultivation and all inland areas as unsuitable. Recent investigations shew that the soils on the coastal flats vary considerably and certainly include areas that are unsuited to coconuts: on the other hand, there is no conclusive evidence that inland soils are necessarily unsuitable for coconuts.

As the country becomes developed, the choice of sites for extensions of the area under coconuts becomes narrowed, so that any evidence that can be adduced regarding the suitability of definite types of soil are of value. The article in this number on Coconuts on Peat, by Mr. F. C. Cooke should therefore prove useful for those who are considering the employment of reserve areas on their estates or who contemplate extensions in new areas.

The Malayan Agricultural Journal. The present is the final number of Volume XVIII of the *Malayan Agricultural Journal.* Judging by the expressions of approval that have come to our ears, the public of Malaya appreciates the changes in the Journal which were effected at the commencement of the year. The steady increase in circulation is gratifying, but there are still many engaged in agriculture in Malaya who do not regularly read the Journal and we cannot rest satisfied until this publication finds its way to every estate in the country.

Publications are the chief means whereby the results obtained by research work—in the laboratory and the field—can be conveyed to the planter. In addition to the articles which embody the results of research work, the Journal has two further functions, viz: by means of articles and statistics to give a true perspective of the agricultural conditions obtaining in Malaya, and by means of selected articles, abstracts and reviews to bring to the notice of readers the results of research work in other countries that have a bearing on Malayan agriculture.

Planters are perhaps prone to disregard agricultural publications because of their multiplicity. The publication of several agricultural journals in one country is apt to confuse, and it generally results in much important information not reaching the readers for whom it was intended. In order in some measure to obviate such confusion, agreement has been reached between the Rubber Research Institute of Malaya and ourselves concerning the publications of the two departments. The Quarterly Journal of the Rubber Research Institute of Malaya will cease publication at the end of 1930 and all articles of a general nature concerning rubber, prepared by the Institute, will thereafter be published in the *Malayan Agricultural Journal.* The results of research

work performed by the Institute will be published by that body in a journal at irregular intervals as subject matter becomes available. It is anticipated that this arrangement will widen the scope of the *Malayan Agricultural Journal* and thus render it more useful to agriculturists in Malaya.

Special Bulletins. The Department of Agriculture has published during 1930 a number of Special Bulletins. Some of these have been of a technical nature likely to interest the scientist rather than the practical planter. But at least four of the eight Special Bulletins are of a description that should interest agriculturists.

The programme of Special Bulletins for 1931 is an ambitious one. It includes the following three publications:—

Tapioca in Malaya— the result of several years of research work.

Insects of Coconuts— giving a complete account of the insects—both beneficial and harmful—that are associated with coconuts. This publication should prove of great value as a book of reference for coconut planters.

The Oil Palm in Malaya—Bulletin No. 39 on this subject, published in 1927 is nearly out of print. This publication is therefore being carefully revised and brought up to date by the inclusion of valuable material that has since become available.

It is hoped that all those concerned with agriculture in Malaya will make a point of including the publications of this Department on their book-shelves during the coming year.

Original Articles.

MECHANISED RICE CULTIVATION IN SOUTHERN SIAM

BY

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and

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In connection with the work of the Rice Cultivation Committee, the writers visited the plantation of Messrs. Chin Leong & Co., in the Patalung District of Southern Siam. For some years past Messrs. Chin Leong & Co., have grown rice on a large scale by means of tractors, ploughs, harrows and modern harvesting machinery. The members of this firm, namely Yap Hoon Teng, Yap Hoon Hock, Yap Hoon Teong and Yap Hoon Bee, are Straits-born Chinese who have their headquarters in Penang and branches in Medan, Batavia and Haad Yai. Among other things, the firm imports agricultural implements and fertilisers and it was with a view to the extension of these that it first undertook this form of cultivation.

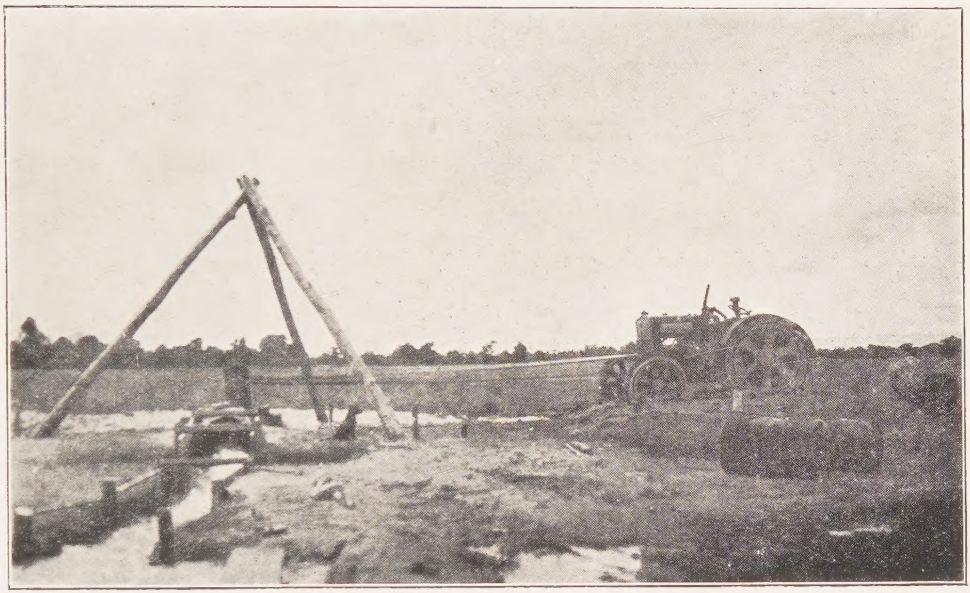
Description of Land.

For the purpose, in 1926 the firm obtained a concession from the Siamese Government of 2,600 acres of land in the Patalung District of Southern Siam. Land had previously been applied for in Kedah, but was not obtained. The land obtained is more or less open country comprising grass land with scattered clumps of small trees. The soil appears to be fairly suited for padi cultivation but it cannot be described as first class padi land since it is rather light in texture although the subsoil consists of heavy alluvial clay, suitable for retention of water.

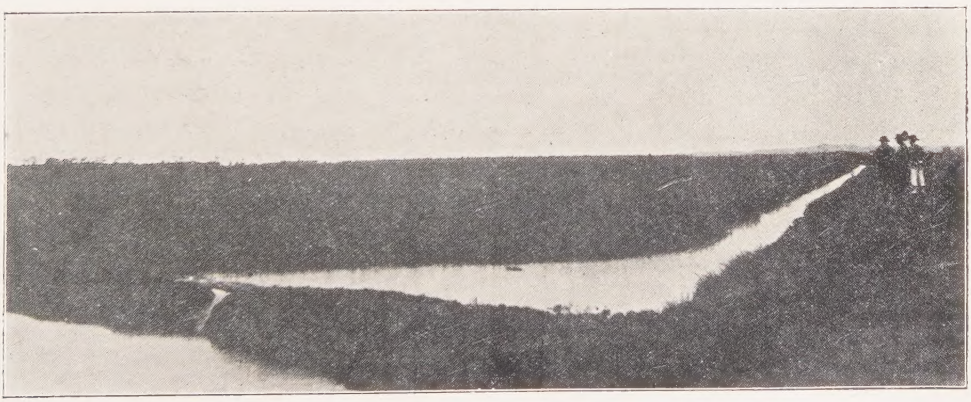
The property is situated some 50 miles north of Haad Yai and about 4 or 5 miles west of the inland sea. Water is available from a small river which flows along the margin of the property and the owners have erected a small dam for the purpose of diverting water on to the land and have also installed pumping machinery. At the time of this visit about 600 acres were already planted with padi.

Machinery.

During the time the Company has been operating this property the owners have made every endeavour to ascertain the most satisfactory implements for



KIMBALL 12 INCH TURBINE PUMP, DRIVEN BY 12/20 CASE TRACTOR.



IRRIGATION CANAL.

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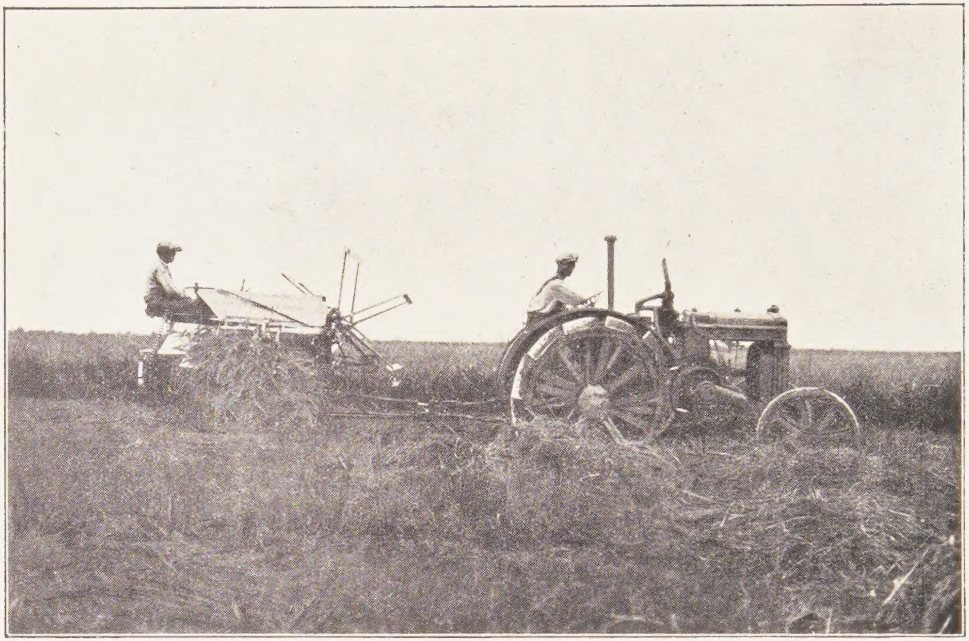

Case Tractor (18—32) pulling 8 ft. Binder.

10 Foot Seed Driller and fertiliser pulled by 12/20 Case Tractor.

undertaking padi cultivation on a large scale. They have also established a very satisfactory system of canals and distributaries for irrigation and are now in a position to control the supply of water with great facility. They have imported six Case tractors of which three are 18/32 H.P. type and three are 12/20 H.P. type tractors. For cultivating the land they have imported and experimented with a considerable selection of ploughs and harrows and have come to the conclusion that for breaking up the new land disc ploughs are preferable. Of these, various types have been tried, the most satisfactory so far found being the Wheatland plough made by J. I. Case & Co. of Wisconsin. This is a new form of plough, the principal feature of which is that it is made either with a 6 or 8 foot cut and respectively provided with 10 or 13 discs fitted vertically on to a spindle which is staggered at an angle of about 45° in relation to the line of draft of the plough. It is stated that this plough gives more satisfactory results than the older and more conventional designs of disc ploughs of which they also possess examples.

For land that has already been in cultivation, in order to turn in the stubble and weeds it has been found that ploughs of the mould board type are preferable and for this purpose three gang mould board ploughs of the type usually worked with tractors and of which the depths of ploughing can be regulated in the usual way are employed.

Cultural Operations.

In preparing land for ploughing, the usual practice is to plough the land once or twice—the number of times depending on the condition of the land—to a depth of 4 or 5 inches and then to follow this by harrowing with a double disc harrow and finally by levelling the surface by means of a float or drag, consisting of two heavy planks lapped and bolted together. It is stated that three 12/20 h.p. tractors can handle 600 acres of land, including the preparation of the land and sowing the seed, in 60 working days of 10 hours, or at the rate of 10 acres per day.

Sowing directly into the fields is accomplished by means of mechanical drills of which two types are employed; one being a 10 foot combination seed and fertiliser drill and the other a broadcaster which is preceded by a fertiliser spreader. It is followed by a harrow. The seeding machines employed are the Peoria Combined Grain Drill and Fertiliser Spreader and the Endgate Broadcaster. It is stated that cultivation and seeding operations have to be carefully watched in relation to the degree of moisture content of the land, satisfactory results only being obtained within rather narrow limits of soil moisture content. Experience has shown that by working at suitable seasons and by regulating the moisture supply to the land by means of irrigation water, little difficulty normally exists in preparing and sowing the land. The writers were unable to see the tractors working owing to the fact that recently there had been heavy rain, but the work done was inspected in its various stages and it was seen that the operations produce a tilth which is eminently suitable for rice cultivation.

It may be added that, in relation to methods of sowing the seed, the drill results in a more regular stand than does broadcasting, but on the other hand, where time is an object, broadcasting is much more rapid.

Manuring.

Regular manuring of the land is practised and in this connection numerous fertilisers have been tried including ankerphos, plutophos, ammophos, nitrophoska and leunaphos. The owners have no definite information as to the fertiliser that gives the best result, but they appear to prefer ankerphos. It is doubtful whether, in the early stages of development of the land, fertilisers can have much effect in view of the fact that the land cannot have been under cultivation for a long period, although at a later date, benefit will doubtless accrue from the application of these fertilisers. It is understood that in due course the proprietors will carry out properly designed experiments to test the efficiency of fertilisers.

Water Supply.

Considerable importance attaches to the manner in which water is led on to the land after sowing. The procedure adopted is to irrigate the land sufficiently to make for a slightly damp condition until the seed has germinated and the crop has grown to a height of about 10-12 inches; the plots are then gradually flooded. There appears to be no shortage of water at the present time and the water control arrangements are admirably devised.

As stated previously, water is obtained by means of a dam on the river which also diverts the water into a conduit from which it is pumped to the fields. The pumping is performed by means of a Kimball 12 inch turbine pump with a lift of 6 feet and a discharge capacity of 3,000 gallons per minute. The pump, which costs approximately $2,000/- is driven by a belt from a 12/20 h.p. Case Tractor which consumes one gallon of lubricating oil and three tins of kerosine per 12 hour day. The pump appears to require the minimum of attention and is stated to give general satisfaction. For digging ditches for irrigation, a Martin ditcher is employed which is hauled by a Case tractor.

Harvesting.

Harvesting is accomplished by means of harvesting machinery. The owners have imported two McCormick twine binders each with 8 ft. cut, and a Case thresher. In learning to operate these they were assisted by a representative of J. I. Case & Co. who came from India specially to start the work. As an alternative method of harvesting they very recently imported a Sunshine Header harvester with a 6 ft. cut. This is a new type of machine which has found application in padi cultivation in Australia. It combines in one machine the three operations of harvesting, threshing and winnowing. It is stated by the owners that one of the difficulties experienced is the uneven ripening of the grain owing to the employment of local mixed seed and the suggestion was

made that greatly improved results should accrue from the use of pure strains which give a stand of uniform height and which ripen uniformly.

It is stated that average yields of 450 gantangs of padi per acre are being obtained and that the scheme is profitable. The following data have been obtained as to costs on new land:—

Ploughing and harrowing	...	...	$6.60 per acre.
Manuring and sowing	...	...	$1.25—$2.00 ,, ,,
Total cost of preparation of new land		...	$8.00—$8.50 ,, ,,

As far as can be ascertained, the cost of pumping water to the land works out at about $3.50 per acre; no data were available regarding the cost of harvesting.

The demonstrations that have been given by these Chinese gentlemen are of the utmost importance as they definitely settle a point that has been argued on many occasions, namely, whether or not the mechanical methods of cultivating rice which have been successfully developed in California, the Southern States of America and in Australia are applicable in the Eastern Tropics. The answer is definitely in the affirmative. Figures are not available to show the whole cost of the operations of planting and harvesting the crop, but calculations made by the Department of Agriculture indicate that the cost including supervision would probably be in the region of $20/- per acre. At this rate and with an average market price for padi of 13 cents per gantang, a very reasonable margin of profit may be expected from operations of this description.

COCONUTS ON PEAT

BY

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Considerable doubt exists as to the suitability of "peat" and "organic" soils for coconuts. In many cases the young palms thrive remarkably well, but there are indications that under certain conditions this early promise may not be fulfilled. Sampson[1] roundly condemns such soils; there is, however, doubt as to whether this condemnation is rightly directed to the soil rather than to the lack of provision of proper drainage as understood and practised in Malaya.

As there is confusion in the use of the term "peat" which is loosely applied in this country to any soil which contains notable quantities of organic matter, it is advisable to define what is really meant in these notes by "peat" and "organic" soils respectively.

Peat.—The word "peat" is taken to indicate a soil which consists of compact coherent masses of plant residues. Three different types of peat are generally recognised, differentiation being made according to the nature of the original plants:—(1) Moor (high moor or upland peat) formed from mosses, (2) Fen peat, formed by the decay of reeds and similar aquatic plants and (3) Carr or wood peat formed chiefly from trees.[2]

The coastal peats of Malaya appear to belong to the Fen and Carr formations. The peats are found lying between the true coastal alluvium and the inland quartzite formation. When the underlying soil is reached it is usually found to be intermediate in properties between the coastal alluvium and inland soils generally quartzite.

It seems highly probable that a ridge of coastal alluvium was built up in the region of the present sea-board giving rise to swamp or lagoon conditions between itself and the quartzite. Gradually a clay bed was laid down in the lagoon by erosion of the higher lying quartzite with the formation of Fen conditions, i.e. with growth of Cyperaceae (reeds and sedges) which by their decay gradually raised the ground level. This, in the course of time, became covered by forest and forest litter.

At the junction of the original swamp with the alluvium and inland soil respectively, a thorough admixture of decaying vegetation and mineral soil is usually to be found in belts of varying width and depth (the latter from a few inches to four feet) overlying a stiff clay in the former, and a soil of inland type in the latter case. Such soils are very frequently referred to as "peats"

(1) The Coconut Palm—Sampson, H. C.

(2) Evolution and classification of soils—Rahmann, E. Page 74 and seq.

although the name is in this case a misnomer—it is preferable to refer to them as "organic" soils.

The true peat is distinct, usually red brown to red black in colour, fibrous and containing very little mineral matter; it has a very acid reaction and on too deep or too rapid draining crumbles to a dry powder which it is almost impossible to reconvert into its original fibrous condition.

Apart from appearance and texture, the degree of "peatiness" of a soil can readily be determined by burning and weighing the residue—the amount lost expressed as a percentage of the dry soil is the familiar "loss on ignition" of soil analyses. "True peats" show loss on ignition exceeding 80 per cent. while "organic" soils show losses varying from 15 to 80 per cent.

An extensive tour has been made of the main peat areas of Malaya, in order to make observations on coconuts growing on true peats.

Description of the Areas Visited.

Four main types of peat formation have been inspected:—

South Central Malaya.

(a) A larger inland area where the peat is woody, fibrous, of great depth and very water-logged.

(b) An adjacent area where the peat is of the same type, but while generally deeper than eight feet, is not such a thick formation as the previous area, nor is the water level as high.

(c) Two narrow tongues of peat of no great depth or breadth running from the inland areas towards the sea.

Southern Malaya.

(d) An extensive peat area near the sea, of varying thickness and ranging from black earthy peat to a fibrous woody mould which dries to a crumbling powder. The whole of this area has underlying it the heavy clay characteristic of the majority of Malayan coconut areas.

North Central Malaya.

(e) A river of peat with a thin top soil of grey clay.

South Central Malaya.

A new trunk road is in course of construction through the vast peat swamps (a) and (b) which are some 12 miles from the sea and which are adjacent but separated by a large hill or island of light sandy clay. As already explained, these areas lie between the quartzite of the interior and the alluvial clay of the coastal plains. A community of Javanese immigrants has settled here and cleared over 10,000 acres of virgin jungle. Area (a) is already practically abandoned because the settlers have been unable to cope with the high table of rapidly moving water which is found close to the surface of the soil

in spite of frequent well-made cross drains and excellent main drainage. Work on area (b) is progressing and while the young palms are developing, an extensive range of catch crops appear to be thriving well.

The thickness of the peat in area (b) is considerable and at one point it is said to be about 15 feet. The peat in area (a) is even of greater depth and actual borings gave at two different points 36 feet and 44 feet respectively. While area (a) is water-logged, the water table is not reached in area (b) until between 2 and 3 feet. The presence of raised paths, however, is evidence that this area is also liable to floods. It would appear that the formation consists of two extensive lakes of peat filling the valleys between foothills of light sandy clay which are dammed by the alluvial coastal ridge.

Drainage, Cultivation and Yield.—Two well-made drains 10 feet wide flank each side of the main trunk road and cross drains are being constructed at approximately 50 yard intervals (1 per 5 rows), at right angles to the main drains as the palms mature.

None of the palms are in bearing, the oldest being 4 and 5 years. The most interesting feature of the district is the amount and variety of catch crops which are being grown extensively by the Javanese settlers.

Pineapples of the "Queen" type seem to be in particular favour and a considerable number of Sarawak pines are also to be seen; the remaining catch crops are as follows:—coffee, papaya, bananas, caladium, maize, bread fruit, sweet potatoes, tapioca and pumpkins.

Except among the older palms where pineapples are grown almost exclusively and in well ordered rows, the various catch crops are found promiscuously among the young palms and the rotting remains of large jungle trees.

The soil is very resilient and while the top six inches is particularly coarse, woody and fibrous, lower down the peat is decomposed, mushy and of a dark red brown colour. It contains very little inorganic matter as is shewn by the loss on ignition 95-99 per cent. The soil drys to a sawdust-like powder.

The soil samples Nos. 1, 2 and 3 were taken each a mile apart, from the middle of area (b), sample No. 3 being nearest the "island" of sandy clay and taken among the oldest palms. The analytical results are practically identical, and as one would expect, the soils are very acid, while sample No. 3 from the deepest peat is completely burnt away on ignition.

The development of the palms in areas 1 and 2 is very irregular and a few of the young seedlings are conspicuously weak and ill-developed while others are progressing quite well. In the youngest area (sample No. 1) the foliage of the one year old palms is inclined to be yellow and the jungle remains and assorted catch crops appearing at random give the area a somewhat neglected appearance. Sample No. 2 was taken from an area where the palms are two years old and where the ground has been practically cleared of jungle refuse. Here the settlers' houses are of more permanent construction and the various catch crops are being cultivated in a careful and orderly manner, while the palms are in fair condition. Sample No. 3 was taken from

A Top-heavy Good Yielding Palm Growing on Peat.

Coconuts Growing on Peat.

an area approaching the bearing stage where the palms are of even height, between 18 and 20 feet. The fronds of the palms are distinctly yellow in colour and covered with scale, but the catch crop of pineapples is growing well.

The method of planting practised by these Javanese settlers is of interest because it allows for the shrinkage of the soil when the drainage is extended and the water table drops. A hole is dug some 18 inches deep and the germinated seed nut is placed in the bottom and just covered with the original loose top soil leaving the shoot exposed while the remaining soil is mounded round the hole. In the heavy clays of typical Malayan coconut areas, this practice might lead to a rotting of the stem of the young palm by rain water which would collect in the hole, but in peaty soils, water can drain away. It is understood that a similar method of planting is adopted in the light soils of the Philippines to prevent "stilting" and tree-fall and to encourage the growth of a sturdy trunk.

Coastal Area (c).—Heavy alluvial clay is mainly to be seen along the main road which runs close to and parallel with the sea, but in one or two places peat occurs. These peat formations take the form of narrow tongues stretching from the main inland areas (a) and (b) to the sea. It is thus possible to compare mature palms growing on peat with similar palms on the heavy clay typical of Malayan coconut areas and to observe that the former are neither so healthy nor so productive as the latter.

Drainage, Cultivation and Yield.—District (c) while mainly heavy clay, contains one or two peat areas and is all of native planting. The palms are all bearing and those on clay are generally yielding between 30 and 40 nuts per tree except where palms have been planted in salty coastal swamp in which case no nuts are being produced. On the other hand, the palms on the peat are not of healthy appearance. There are frequent gaps in the planting probably because of palm-fall or disease; the palms are shorter than those adjacent; the trunks are less sturdy; the boles are exposed to a height of over two feet; the average yield per palm would appear to be less than 20 nuts per annum and the nuts are small in size.

Occasionally, a palm estimated to produce 50 nuts per annum is to be seen, but against there are very many non-yielders.

Soil sample No. 4 was taken from a small holding and sample No. 5 was taken from a large native plantation where the grass and fern is allowed to grow as a cover, being kept well slashed, and where good drainage is practised.

Southern Malaya.

This district proved particularly interesting because a variety of conditions was met with in the same extensive peat area on a European estate while palms of ages ranging from 2 to 30 years old could be inspected.

The areas sampled were as follows:—

No. 6. Peat $3\frac{1}{2}$ feet thick with underlying clay—poor yielding mature palms.

No. 7. Peat more than 4 feet thick—boggy and overgrown—bad yielding mature palms.

No. 8. Peat 2 feet thick with underlying clay—high yielding young palms.

No. 9. Peat of unknown thickness—seedlings in good condition.

No. 10. Peat $4\frac{1}{2}$ feet thick with underlying clay—fair yielding mature palms.

Drainage, Cultivation and Yields. Area No. 6. The palms in this area are said to be 20 years old and are estimated to yield less than 40 small nuts per annum in spite of regular cultivation and good drainage. The land is very low lying and the water table at the time of visiting was about one foot from the surface although drains are laid every third row. The cover is the reddish sedge indicative of an acid condition of the soil which is wet, black and weathered to a homogeneous mass. No tree fall has occurred although water-logging is of frequent occurrence and soil shrinkage amounting to two feet has taken place. This is because the trees are not tall and because they are low yielders. The underlying soil is reached at 3 feet 6 inches and consists of light grey heavy clay.

Area No. 7.—In this area the palms are said to be 20 years of age but, because the soil is so continuously water logged, the palms are short, their trunks are thin and the nuts are few and small. The conditions being so unfavourable it is not considered worth while to do more than an occasional slashing back and at the time of the visit the land was considerably overgrown with fern and other heavy weeds.

Between Areas 6 and 7, intermediate conditions exist. The area is cultivated regularly, but the palms are stunted and are poor yielders while occasional gaps occur. In the adjacent native holdings, similar water-logged conditions exist. The palms are very poor yielders and are crowded out by areca palms and close grown pineapples.

Area No. 8.—This area is undoubtedly the best in the whole of the peat districts visited. The palms are seven years old, and although only 20 feet in height and having sturdy trunks, they are already beginning to lean, because of the spread of the crown and the weight of nuts. The peat is more earthy than any previously mentioned, probably because it is only two feet in thickness.

The palms bear between 40 and 100 nuts and average about 60 medium sized nuts per annum. Few cross drains have yet been dug. The cover is obtained by selective weeding leaving low fern which is growing very thickly.

Area No. 9.—The soil and general conditions appear to be similar to those of the driest parts of the peat areas (a) and (b). The peat is also very woody and fibrous and of recent origin and its depth, which is unknown, is definitely greater than six feet.

This area was opened up just over two years ago. It is now clean weeded, very well kept and traversed by well made drains and cross drains; the latter are laid every twenty rows. Because this soil is liable to dry, the cross drains are allowed to silt up to retain the moisture in the soil. The soil is more

COMPARATIVE RECORDS OF COCONUT PALMS GROWING ON PEAT IN SOUTH CENTRAL MALAYA.

	Abandoned (a)	3rd Mile (b) No. 1	2nd Mile (b) No. 2	1st Mile (b) No. 3	Inland (c) No. 4	Coastal (c) No. 5
Loss on ignition of dried soil	...	95	95	99	74	96
Acidity (pH unfiltered)	...	4.2	4.2	4.2	4.0	3.5
(pH filtered)	...	5.4	5.2	5.4	5.2	5.2
Age of palms—estimated	various	1 = 1½ years	2 years	4-4½ years	25-30 years	say 25 years
Condition of palms	bad	variable	variable	much scale insect	good tall medium	poor medium small
Size of nuts	...	...	...			
Estimated yield per tree per annum	...	. .	...	few nuts or none	av. 20 (Max. 50)	av. 20 (Max. 50)
Method of planting	...	Javanese sunken hole	Javanese sunken hole	Javanese sunken hole	Native	Native occasional
Drainage—cross drains	1 in 5 rows	very few	very few	very few	...	3 ft. 6 in.
Water table (at time of visit)	6 ft.	2 ft.	2 ft.	2 ft. 6 in.	2 ft. 3 in.	grass & fern
Cover	...	...	...	...	clean	some arecanut palms
Catch crops	...	various	various	almost wholly pine apple	...	
Description of peat	dark brown	Fibrous slimy red brown	fibrous slimy red brown	slimy red brown	black humus	red brown
Depth	26ft. to 42ft.	8 ft.	unknown	said to be 15 ft.	more than 6 ft.	more than 6 ft.
Moist or dry	...	moist	moist	moist	damp	damp
Shrinkage or tree fall	...	...	...	tree fall 1 in 4	1 ft. 6 in. shrinkage.	2 ft. shrinkage no tree fall
Underlying soil	...	probably light sandy clay	probably light sandy clay	probably sandy clay	...	probably sandy clay

COMPARATIVE RECORDS OF COCONUT PALMS GROWING ON PEAT IN SOUTHERN MALAYA UNDER ESTATES CONDITIONS.

—	Area No. 6. (d)	Area No. 7. (d)	Area No. 8. (d)	Area No. 9. (d)	Area No. 10. (d)
Loss on ignition of dried soil-	95	83	62	95	94
(pH unfiltered) -	3.8	4.3	4.0	4.2	3.7
Acidity (pH filtered) -	5.2	5.2	5.2	5.0	5.0
Age of Palms—estimated -	say 20 years	say 20 years	say 7 years	2¼ years	25—30 years
Condition of palms -	fair	poor	fairly good	good	good
(Height) -	medium	short	...	...	tall
Size of nuts -	small	small	medium	...	small
Estimated yield per tree per annum	40	av. 10	av. 60 (max. 100)	...	45—50
Method of planting -	Native planted	Native planted	European planted	European planted	Native planted
Drainage—cross drains -	1 in 3 rows	1 in 5 rows	very few	1 in 20 rows	1 in 6 rows
Water table (at time of visit)	1 ft.	Less than 1 ft.	1 ft.	1 ft. 6 ins.	2 ft.
Cover - -	peat grass	overgrown	fern	none	fern and peat grass
Catch crops - -	... (Areca palms and pineapple native holdings adjacent)	... (Areca palms and pineapple on native holdings adjacent)	...	coffee (Areca palms and pineapple on native holdings adjacent)	...
Description of peat -	earthy brown dark	earthy black	earthy black	woody and brown	earthy dark brown
Depth - -	3½ ft.	more than 4 ft.	2 ft.	unknown	4½ ft.
Moist or dry - -	moist	water-logged	wet	damp but dries to a powder	damp
Shrinkage or tree fall -	1 ft. shrinkage no tree fall	...	tree fall in the future probable	...	a little
Underlying soil -	probably grey clay	probably grey clay	grey heavy clay	probably grey clay	grey heavy clay

fibrous than elsewhere and is full of rotting wood. Coarse red sedge grows very readily and needs frequent removal.

The young palms are of healthy appearance and of even height. Coffee is to be grown later as a catch crop while on the adjacent native holding areca nut palms are being grown in the ratio of 4 areca to 1 coconut palm.

Area No. 10.—This area was originally of native planting. The palms, which are the tallest seen on this tour and may be estimated to be between 25 and 30 years old, are moderate yielders of small nuts.

Square planting with 60 trees to the acre has been adopted and cross drains are laid every sixth row. Fern and sedge are allowed to grow but are frequently slashed back. Although the palms are tall, only those adjacent to the drains appear to be liable to tree-fall. In this area water is found at 2 feet and clay at $4\frac{1}{2}$ feet.

North Central Malaya.

The area inspected presented several unusual features. It consists of a broad river of peat, some 200 yards in width, originating in the jungle and traversing an estate a few miles south west of Teluk Anson. The peat fills a valley in the very heavy alluvial clay which is very impervious to water and which forms a bank some four feet in height on both banks of the 'river.' The peat is overlaid with grey clay and boggy conditions are very apparent. The peat deposit is between three and four feet in thickness, and is superimposed by six inches of a mixture of clay and peat followed by six inches of heavy grey clay on top. The district was visited during a period of heavy drought, nevertheless in this area, water was met with at about 15 inches depth.

Coconut Palms on Peat in North Central Malaya.

		Sample 11 Top Soil (e)	Sample 12 Underlying Peat (e)
Loss on ignition of dried soil	...	12.5	75.1
Acidity — pH unfiltered	...	5.1	5.1
Acidity — pH filtered	...	6.8	6.8
Age of palms—estimated	...	...	25-30 years.
Condition of palms — Health	...	...	good
Condition of palms — Height			medium
Size of nuts	...	...	medium
Estimated yield per tree	...	...	30 to 40
Method of planting	...	...	European 55, square per acre
Drainage—cross drains	...	...	1 every 4 rows
Water table (at time of visit)		...	18 inches
Cover	...	...	grass and fern
Catch crops	...	...	nil

Description of soil	heavy grey clay	red brown peat
Depth	1 foot	3ft. to 4ft.
Moist or dry	moist	
Shrinkage or tree fall	1ft. 6 inches shrinkage severe tree fall.	
Underlying soil	probably very heavy clay.	

The figure for *p*H indicates degree of acidity. *p*H 7.0 is practically neutral, and *p*H less than 5.5 indicates very definite acidity. The degree of harm done under Malayan conditions of a high acidity (i.e. low *p*H) remains to be ascertained, but high acidity in the soil indicates that unfavourable conditions exist.

Drainage, Cultivation and Yields.—From the above description, it will be seen that the conditions are more favourable to coconut cultivation than are the areas previously described. There is less chance of the soil drying up in dry weather and the top layer of clay provides food for the palms.

The palms are all of very healthy appearance, the yield of nuts may be estimated at between 30 and 40 per palm per annum. The palms, however, are leaning very acutely and serious tree-fall has reduced the probable yield of copra to about three to four pikuls per acre.

Conclusions.

1. The observations recorded are unfavourable to "peat" as a medium for coconut cultivation. Whether this is due to excessive acidity, lack of available plant food, or to difficulties in controlling the water can only be determined by experiment. It is hoped that such experiments will be laid down in the near future in order to determine whether measures of soil amelioration will lead to a commercially profitable result.

2. It should be clearly understood that these observations which support Sampson's contentions, refer to true "peat" and not to "organic soils". Coconuts on the latter type of soil and on heavy clays in the majority of cases have given profitable yields for many years. The exact conditions for success on such soils, however, cannot yet be laid down with certitude.

3. It is emphasised that distinction must be made between deep peat and thin layers of peat. In the former case, unsatisfactory results will only be shewn after the first ten years whereas in the latter case, although severe tree-fall occurs, so reducing the yields per acre, the condition of the foliage of the remaining palms is very good and the yields of nuts are satisfactory.

4. Special attention is drawn to the extreme shrinkage which occurs in thick beds of peat as the drainage is extended and as the demands of the palms increase with growth. Usually this will cause palms that are bearing to fall, while the non-bearers remain standing, but the Javanese allow for this by the "sunken hole" method of planting.

The author wishes to thank Messrs. W. N. C. Belgrave and J. H. Dennett for the technical notes on peaty soils and for advice tendered; also Mr. F. de la Mare Norris for assistance during the tour.

MILDEW DISEASE OF HEVEA*

BY

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The disease was first noticed by Arens in 1918 on rubber growing in the Malang District of West Java. Within a short time he showed that the disease was present throughout that country where it has since caused serious trouble. In 1925 it was reported from Malaya and Ceylon but the disease was not regarded as of serious dimensions. It is now present to a greater or lesser extent throughout the rubber growing districts of the East.

In Malaya several outbreaks were reported in 1928 and though only slight leaf fall occurred the fungus was probably more widely spread than was thought. The first serious leaf fall due to Mildew occurred after the early wintering of 1929 in the Klang—Kuala Selangor district and in northern Negri Sembilan. The rains, however, very quickly prevented further trouble that year.

In 1930, however, the long period of comparative drought in certain districts produced a very widespread attack, and of a nature so serious that the attention of estate managers was drawn to the consideration of possible effects of the disease and of means by which the disease might be controlled.

Symptoms.

The first noticeable effect of the fungus on the leaf is that growth of the young leaves becomes arrested, the leaves wrinkle somewhat and curl or fold backwards. Discolouration then takes place rapidly from the tip downwards and the leaf falls off, though still in a soft succulent condition. The leaves fall off singly, the petiole remaining attached to the stem. In the case of Phytophthora leaf fall the three leaves and petiole fall off together.

If treatment is given or if unsuitable weather comes on during the attack the weak pendant curled leaves will recover in time to give extended, malformed, wrinkled, pale, mottled leaves, many of which may have been so weakened by the attack as to be forced off by subsequent wind or rain.

It has been frequently observed that in advanced cases when the leaf is beginning to discolour, great difficulty may be encountered in demonstrating the presence of the Oidium fungus while other secondary fungi may often be found in abundance on such specimens. It seems reasonable to suppose that the fungus ceases its activity on the leaves as soon as the leaf begins to die or as soon as the leaf has become old enough to have acquired a cuticle which, so far as this fungus is concerned, may be regarded as impenetrable.

*First part of paper read at the Second Inter-Departmental Conference, on October 29th, 1930.

The mildew fungus usually attacks only young leaves of up to 2 inches long. In other countries it is reported that older leaves may be attacked.

On the flowers and flower stalks a luxuriant growth of the fungus can often be found after a period of inclement weather even when the leaves fail to show the active fungus. It is presumed that the natural hirsute condition of the flowers affords a means of carrying over infection from one set of new leaves to the next, despite occasional heavy showers.

Infected flowers show a very distinct glistening white appearance of the glumes, they become hard and brittle and are easily shaken off. With a hand lens the conidiophores and spores may easily be seen extending beyond the hairs of the stem and flowers.

Active sporulating growths of the causal fungus may be found on flowers in known infected areas throughout the year. The writer has repeatedly demonstrated luxuriant growths of the fungus on flowers taken at various times throughout the past year from trees in a small area near Kuala Lumpur. During these investigations, living normal and germinating spores have been found in the axils of mature leaves, in the bud scales of terminal buds and upon other parts of the tree. These spores, in all probability blown from a nearby flowering tree, develop a mycelium which lies dormant until the buds throw out the fresh young leaves or flowers, when rapid growth, and production of further spores takes place on the new field of attack. Young leaves produced in the off season did not show the presence of the fungus. During the off season the heaviest infection can be found in flowers developed from the more rapidly growing terminal buds. It would appear therefore that such buds are the seat of the resting mycelium developed from wind born spores which may serve to carry over the fungus from year to year.

Microscopically the causal fungus *Oidium Heveae* shows the typical "Powdery Mildew" (Erysiphaceae) structure. A superficial, delicate, creeping, hyaline mycelium develops on the surface of the young leaves, petioles and flowers. Food is obtained from the epidermal cells by means of special feeding organs known as haustoria. From the creeping mycelium numerous short erect conidiophores are produced bearing at their tips one or more oval conidia. At ordinary room temperature (25°C-30°C) chains of 2-4 spores are often developed within two days while in cold chamber (13°C) rapid growth with the production of chains of 3-7 spores has been obtained on living Hevea flowers in the same period of time. It would appear, therefore, that optimum growth takes place at temperatures considerably lower than those normally experienced in tropical countries.

Mycelium hyaline, 4 microns wide, very much branched and septate near the junction of the branches.

Conidiophores 50-120 microns long, 6 microns wide, slightly tapered in the middle, basal cell 36-90 microns long, remainder two-septate, cutting off spores in chains.

Spores 24-36 microns long × 12-18 microns wide averaging 30 × 15

microns, oval or barrel shaped with rounded ends. Though the spores germinate easily on a dry surface in a damp atmosphere or on media they fail to continue to grow in culture after producing a germ tube some 200-300 microns long with appressoria. A living medium is essential to its continued growth. The fungus is therefore termed an "obligate parasite."

Effects of the Disease.

The presence of the fungus in the terminal or other buds has little or no effect on the growth of the stem. Indeed an examination of such buds often reveals the presence of many different species of fungi of which a *Cercospora* sp. known to cause abnormal lenticel development and abnormal cork formation is very common, especially during dry weather.

The young shoots, however, may be repeatedly defoliated and the stems exhausted of reserve foods causing a dieback of the leading stems.

It is reasonable to suppose that this exhaustion of reserve food material of the tree is likely to retard growth considerably, while the abnormal transpiration brought about by the evaporation of water from the damaged cuticle surfaces of the leaves and stems is sure to enhance the effect of the dry weather conditions during which the fungus is most active.

The effect of the fungus on the flowers is seriously to reduce the quantity of seed. Flowers are destroyed and fall off either before opening or immediately afterwards. Most rubber trees, however, flower a second time during the year, but recent observations show that the disease may be found on flowers throughout the year. During certain months, however, the fungus was not so active as in others, and flowers formed during those months were observed to set a few fruits. In view of the fact that the most prolific seeding trees in a block of rubber kept under observation were trees obviously suffering from root disease it is preferable that seed for future planting programmes should be chosen from districts known not to have suffered from Mildew attack.

Effect on Yield.—So far the writer has been unable to obtain reliable information with regard to the effect of the disease on the yield of individual trees or fields of rubber. The effect of drought, wintering and disease is variously estimated at 15-30 per cent. of average monthly yield during a certain period. After examining many estate books the writer is of the opinion that the effect of drought and Mildew disease together is to produce a slightly lower yield during wintering, and to prolong the lowering in yield effect of wintering to a period of not two months but to three or even four months.

Methods of Control.

It was early suggested that various methods of cultivation and manuring applied to the soils might enable the plant to withstand attack. Subsequent investigation, however, shows that although a more rapid recovery from the disease takes place in manured or well cultivated areas, such areas nevertheless may be just as virulently attacked as other areas.

The action of nitrogenous manures in delaying wintering may or may not be of advantage, according as the dry weather and greatest activity of the fungus come before or during the wintering of trees on such manured areas.

The breeding of varieties of Hevea immune to attack would require a long period of years before results could be expected. For present plantations, therefore, a direct attack on the fungus is the best means of control, and for this purpose the use of sulphur and sulphur compounds have in the past been proved to effect control of similar diseases of other crops and in other countries.

The use of a liquid spray is very costly in view of the high power machines required to send a fine spray jet to the required heights and the high costs of labour and transport of the large quantities of water required to make the spray mixture.

Dusting with a fungicide in the form of a fine dry powder presents the cheapest and most efficient method of controlling mildew disease.

Experience has shown that the best substance to use is sulphur dust. Sulphur dust applied at the rate of 10-12 lbs. per acre by means of a power duster is sufficient to give temporary control of the disease.

This treatment is repeated at intervals of 6 or 7 days until the refoliation period is over. Four or five such dustings will be required. An estimated cost of a season's treatment is roughly $5 per acre.

It is essential for the proper working of dusting machines that the sulphur particles be as fine and dry as possible, otherwise a cloud of sulphur dust cannot be obtained, and the sulphur falls to the ground within a few yards of the machine. A motor duster of the Bjorklund Duster type can effectively treat some 250 acres per day. For small areas various forms of hand and foot dusters are on the market, and are useful in the treatment of budwood multiplication and other nurseries to control the activities of mites and leaf spot fungi.

THE GOVERNMENT DAIRY, COLOMBO, CEYLON

BY

B. Bunting,

Agriculturist.

The original Government Dairy, Colombo, was started in 1893, but as the land which it occupied was required for other purposes a new dairy, equipped with modern buildings, was opened in June, 1921.

The dairy is situated on the outskirts of Colombo and is about 3 miles from the centre of the town. The mean maximum shade temperature is about 90°F. and the mean minimum about 70°F., giving a mean air temperature of approximately 80°F. The mean rainfall is stated to be roughly 92 inches per annum with an average of 175 rainfall days during the year.

The total area of land occupied by the farm is 85 acres. About 30 acres are reserved as paddocks for grazing, 30 acres under fodder grasses and the balance of 25 acres forming building sites.

Livestock.

At the time of the writer's visit,* the herd consisted of 315 head of cattle, comprising 165 milch cows (98 at present in milk), 15 stud bulls, 16 draught bulls and the balance young stock.

The pure-bred Scind cattle formed the basis of the herd, but these were crossed with pure-bred Ayrshire bulls, the first cross giving excellent results.

Cows.—The cross-bred heifers are put to the bull at the age of 2 years and 3 months, so that they are due to calve at 3 years of age. The lactation period varies from 8 to 10 months, the heifers being put to the bull again about 2 months after calving.

There are three pure-bred imported Ayrshire heifers in the herd, but they are subject to Red-water fever (Piroplasmosis) and have not proved nearly so successful as the pure-bred imported Ayrshire bulls.

Stud Bulls.—There are a number of pure-bred Scind bulls and three pure-bred Ayrshire bulls imported from Scotland. Two of the Ayrshire stud bulls have been in service for over 4 years and are still quite sound. These bulls are from pedigree stock and cost about Rs. 3,000/- each, delivered in Colombo. A bull will serve up to 100 cows a year, but each stud bull is only worked once, or at the most, twice a week. A castrated bull is run with the milking herd to show which cows are in oestrum. These cows are then put to a selected stud bull. A pure-bred Scind bull always runs with the dry herd in order that any cows that have missed subsequently being covered by the pure-bred bull.

*While on special duty in Ceylon during February, 1930 the writer visited the Government Dairy, Colombo with a view to collecting information on the working of this old established dairy which is run under the auspices of the Ceylon Government.

Young Stock.—With the exception of a few specially selected heifers, which are kept at headquarters, all heifers are sent out to the Ambepusa Farm, about 40 miles away, where they are run with a pure-bred Scind bull.

Housing Accommodation.

The general lay-out of the buildings on the farm is based on previous experience, with the result that the various cow-sheds are spaced well apart with a view to isolation. The food store is placed well outside the dairy enclosure so that draught cattle are not allowed to come inside the area occupied by the dairy herd and bring in disease from outside sources.

The cow-sheds are lean-to structures, built of heavy iron stanchions, brick backs, French-tiled roof and concrete floors, and are open at the front. They are U-shaped with an open yard, 30 feet wide, covered with concrete, having a large water tank in the centre for watering the stock and washing down the stalls. The cow-sheds are about 150 feet long and 12 feet deep with iron stanchions every 10 feet. The cows are tied up between each stanchion so that 5 feet space is allotted to each cow. The height from the ground to the eaves does not exceed 7 feet. It is important that the long axis of the cow-sheds should run east and west so that the sun passes over endways across the sheds.

The dry cows and incalf heifers are housed in a separate shed some considerable distance from the milking stock.

The stud bulls are housed in an open shed with French-tiled roof carried by iron stanchions and angle iron. The shed is divided by six-foot brick walls with an iron gate on the open front. Three rows of iron piping, 15 ins. high and 15 ins. from the wall, serve as a manger and for tying up the bulls.

The calves are housed in a 12-foot lean-to shed, which is divided by a low brick wall into 5 rooms 20 feet wide. There is a 12-foot open space in addition to the 12-foot shed and this leads to a 6-foot passage. The calves are divided into groups according to size so that they do not steal each others food. There is a large open grassed yard, about 150 ft. × 100 ft., enclosed by a 4-foot wall, in which the young stock can take exercise.

Grazing.

The milking cows are turned out to grass for two hours after milking and before feeding, night and morning, but this is merely for exercise, since the cows are stall-fed with fodder grasses.

The dry stock are kept all day in a separate paddock, provided with shade from coconut and Jack trees, and are not allowed to mix with the milking stock.

Feeding.

The milking herd is fed twice daily, at 8.30 a.m. and 4.30 p.m. The dry herd is only fed once a day, in the evening, so as to encourage grazing.

The present ration for a cow in full milk is made up of the following foodstuffs:—

2 lbs.	Gingelly poonac
2 ,,	Coconut
1 ,,	Linseed cake
3 ,,	Pollard
1 ,,	Dhal husks
9 lbs.	per diem

Half the ration is fed in the morning and the other half in the evening. One ounce of salt and one ounce of sterilised bone is added to the above ration, both morning and evening. All the concentrates are soaked in cold water and fed wet in the form of porridge. Cut grass is given *ad. lib.* twice a day, immediately after feeding. In addition to this they are given a small supply of grass when grazing in the exercise paddocks.

The dry herd receive only one feed of concentrates and one feed of cut grass in addition to grazing in the paddock all day. Rice bran is given in the place of pollard for the dry herd, since it is much cheaper.

The chief grasses grown for fodder are Mauritius, Napier and Merker grass. Mauritius grass forms the staple fodder, since it is much softer and sweeter than Guinea grass and the cattle appear to relish it better.

The calves are brought into the cow-sheds at milking time and allowed to suckle a minute or two, both before and after milking, otherwise the cows withhold their milk. They are then taken back to the calf-pens and given a feed of boiled rice (kunje), pollard and a little poonac. This is placed in shallow tins and they take it as desired. They are also given plenty of fresh cut grass twice daily, which is placed in low racks. Lumps of rock salt are always kept in the calf-sheds so that the calves can take what they require.

Troughs of drinking water, in which is placed a handful of air-slaked lime, provide a continuous supply of fresh water in the calf-pens.

A "Farmer's Portable Boiler", with a capacity of 40 gallons, is used for cooking the food. This boiler was made locally and a strong cast-iron fire-box is fitted below for burning wood.

Water Supply.

A plentiful supply of water is available from a large water tank, both for drinking and washing down the byres. Large cement tanks are placed in the centre of each yard for this purpose and a handful of air-slaked lime is added to each tank daily.

Health of the Stock.

At the time of the writer's visit a slight outbreak of foot and mouth disease had just occurred and six cattle affected with this disease were isolated

in a temporary shed at the far end of a paddock. As a result of the presence of this disease all the walls and floors of the cow-sheds were being sprayed daily with a solution of chloride of lime and water. Tropical chloride of lime is imported in drums of 1 cwt. and one cigarette tin of this chemical is added to each bucket of water to be used for spraying purposes.

Under ordinary circumstances, Jeyes' fluid is sprayed on the walls and floors of the cow-sheds every day.

All the milking stock are washed regularly twice a week with water in an open shed specially provided for the purpose. The shed in question is 36 ft. × 24 ft. × 8 ft. and constructed of strong iron stanchions, French-tiled roof, with strong iron piping round three sides. A cement tank, 15 ft. × 4 ft. × 2 ft. deep, with two taps, provides a supply of water for washing the cattle, while a shower bath is furnished for the coolies employed on milking. The floor is of concrete and there are shallow concrete drains placed round the four sides of the shed to carry off the washing water.

All dry cows, stud bulls and young stock are dipped regularly every week, but not the milking cows, which are only washed and cleaned.

The dipping tank is approximately 50 feet long, 8 feet deep and 5 feet wide and it takes about half an hour to dip 100 head of stock. The tank holds 3,700 gallons and it requires 20 gallons of Cooper's dip, costing about Rs. 150/- to charge it. The tank is emptied and re-charged every six months, but the dip is tested regularly once a fortnight and brought up to the correct strength, namely, 1 in 200. The iodine and starch test is used with Cooper's testing outfit.

Milking.

The cows are milked by hand and each cowman is allotted from 12 to 15 cows. The cows are milked twice a day, namely between 4 and 5 a.m. and again between 1 and 2 p.m.

At the time of the writer's visit there were 98 cows in milk and the output of milk was 285 quarts in the morning and 174 quarts in the afternoon.

A daily record is kept of the yield of milk from each cow by taking the weight of milk on a Sandringham Dairy Herd Recorder.

Yield of Milk.—An Ayrshire-Scind cow, first cross, gave a yield of 750 gallons of milk over a lactation period of 11 months with her first calf. The best pure-bred Scind cows give an average of 600 gallons of milk over each lactation period, the highest yield recorded being 700 gallons.

The Dairy.

The dairy is situated some distance from the cow-sheds. It is a substantially built building, 33 ft. × 20 ft., both fly and ratproof. The roof is of French tiles and ceiled with boards. The sides are covered with white enamel tiles up to a height of 5 feet, with a cement covering on the bricks above. The floor is made of concrete with fine cement

rendering. There are four small ventilators, about the size of a brick, on each side at ground-level and these are covered with wire gauze. Shelves, 18 inches wide, made of concrete, are placed along one side. One shelf is 2 feet 6 inches high and the other about 3 inches above the floor of the dairy, with a drain all round it. The windows are in three sections, the centre one being fitted with glass and the other two with wire gauze. The top panels of the doors are also fitted with wire gauze to keep out flies.

Sale of Milk.—The milk is sold at the rate of 60 cents per Imperial quart and, since practically the whole of the supply is taken over by the Government hospitals in Colombo, it is all sent out in small milk-drums.

Expenditure and Receipts.

The following is a statement of the expenditure and receipts of the dairy for the year 1928:—

Receipts.		
Sale of milk	Rs. 92,565.51	
Sundry sales	7,401.79	Rs. 99,967.30
Expenditure.		
Pay of dairy coolies	11,591.18	
Cattle food	38,101.38	
Stock purchases	5,028.95	
Incidental expenses	3,732.07	
Management	4,000.00	
Ground rent	9,032.00	Rs. 71,485.58
Profit		Rs. 28,481.72

The output of milk in 1928 was 39,031 gallons and the cost of production 30½ cents per bottle of 26½ oz. (1/6 gallon).

General.

Stock sales are held twice a year, when all surplus bull calves and a few heifers and cows, of no use to the dairy herd, are disposed of. The heifers are usually kept for about 12 or 15 months before they are sold.

The working of this dairy farm is a striking example of what can be achieved in the production of fresh milk supplies under the adverse conditions prevailing on the plains in the tropics. There is no doubt that the numerous difficulties connected with such a venture have only been overcome by over 30 years of practical experience. Mr. G. W. Sturgess, the Government Veterinary Surgeon, who I understand has been in charge of the dairy since its inception, is to be congratulated on the excellent results now being obtained.

The writer wishes to acknowledge his indebtedness to the Director of Agriculture, Ceylon for arranging the visit to this dairy and also to Mr. G. W. Sturgess, Government Veterinary Surgeon, Colombo for so kindly supplying the information contained in this article.

TOBACCO CULTIVATION IN KEDAH

BY

W. N. Sands,

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In recent years a tobacco industry has been established on quite a large scale in the Baling District of Kedah. A census taken during the present year showed that there were no less than 220 acres under cultivation with tobacco. It is probable that the relatively high import duty of forty dollars per pikul imposed on leaf tobacco may have given the incentive to planting the crop.

The industry is said to have been started by Chinese who brought over seed from Deli, Sumatra, and who had no doubt gained some experience of tobacco cultivation in that island.

The size of the plots planted is from $\frac{1}{3}$ to $\frac{3}{4}$ of an acre. The chief variety is one of the large-leaved Deli kinds, which is now reproduced from seed grown locally. There is a smaller and coarser-leaved variety cultivated by the Malays for their own use; this latter type, however, is not purchased by the dealers for manufacturing purposes.

The lands on which the crop is grown are situated in the neighbourhood of limestone hills. They vary a good deal in character and may be fairly light or heavy. None of them appears to possess soil suitable for producing a high class of tobacco although the plants develop well when properly cultivated and manured. On newly cleared lands the crop is grown on ridges inter-planted with maize, but the bulk of it is planted by Chinese on lands used for vegetables also and is grown in rotation with these food crops.

The seed is sown, mixed with wood-ashes, in specially prepared nursery beds. Little trouble appears to be experienced with ants or other pests. The beds are lightly shaded with dried ' lallang ' grass or other material and remain shaded until the seedlings are large enough to be transplanted—that is about one month after sowing.

The Chinese grow the tobacco in raised beds 3—4 feet wide, the soil of which is usually manured with bat guano from caves in the limestone hills. The plants are set out at 2 feet square or more. As they ripen from below upwards the leaves are cut off. The first leaves are usually harvested in 30 days from the time of planting and harvesting continues for about one month more, so that a crop is obtained in three to four months from the time of sowing.

Each well grown plant produces 25 to 30 leaves which when dried may weigh up to one-third of a pound. The plants are not topped until the inflorescence appears, but side shoots are removed as growth proceeds. In each plot a few plants are allowed to mature seed. Leaf-eating caterpillars have to be searched for daily and destroyed, but there does not appear to be any serious damage done by pests.

After harvesting, the leaves are allowed to wilt for one day and are then strung on wires, or string, and hung up in the roofs of houses or sheds to dry. There is no special provision for regulating ventilation during the drying process.

After two weeks or longer the leaves are taken down and sold to dealers at prices ranging to-day from $20/- to $25/- per pikul. Before the serious slump in prices of other local products, the usual price was $40/- to $50/- per pikul. The buyers, who are also Chinese, pack the leaves tightly in ordinary sacks and store them for six months or more, after which time they take them out, sort and strip them. The stripped leaf is then sprinkled with a small quantity of oil of anise and mixed with imported Rangoon leaf for the manufacture of cigars. The best portions of Rangoon leaf are used for wrapping purposes. The cigars, which are of poor quality, are sold to local shops in different parts of the State. To date very little leaf is used for cigarette or pipe tobacco but it is understood that machinery for preparing it for these purposes has been imported.

Reliable information regarding the yield of tobacco per acre is very difficult to obtain as spacing, growth and other conditions vary so much, but it is estimated that the yield on well cultivated and manured land should be between 1,400 and 2,000 lbs. of cured leaf per acre, say 10 to 15 pikuls. This is admittedly an estimate which is not based on actual returns, but it is considered to be quite a reasonable one.

After the leaves have been stripped of their mid-ribs and large veins it is doubtful whether the manufacturers obtain and are able to use more than one half of the weight of leaf originally purchased from the grower at $20/- to $25/- per pikul so that the actual cost to them of the leaf they can use is $40/- to $50/- per pikul plus manufacturing and other overhead charges.

FRUITS AND OILS OF OIL PALM VARIETIES.*

Analyses are given of a number of samples of the fruits of nearly all the varieties of oil palms found in Angola; also analyses of the oils of some of these varieties. To a certain extent, the paper is a supplement to a previous one, published in 1927. General conclusions can, however, be drawn from the present figures by themselves.

To the tables giving the results of analyses are added others in elucidation thereof and also in order to discover whether correlations exist which could be utilised in factory control and in selection work.

The botanical nomenclature has, as far as possible, been confined to Chevalier's classification. The varities and types examined belonging to the species *Elaeis guineensis* Jacq. are:—*Sempernigra* A. Chev., *communis* A. Chev. types *dura* and *tenera*, *repanda* A. Chev., *intermedia* A. Chev., *gracelinux* A. Chev., *ceredia* A. Chev., *macrocarya* Becc., *leucocarpa* Becc., *dura virescens nigrascens* Buch and Fick. Those belonging to the sub-species *Elaeis Poissoni* Annet are:—*dura* Annet and *tenera* Annet.

Attention is drawn to the regrettable fact that a great deal of sound analytical work done in the past is of little value for purposes of comparison owing to carelessness in the use of specific names or to the use of vernacular names instead.

Various conclusions are drawn from the tables and attention in directed to the great variability of the fruits of any single variety of oil palm and to their general characteristics. The fruits of the thick shelled varieties are found generally to be larger and heavier than those of thin shelled varieties, but the chemical composition is usually found to differ very little. The thin shelled fruit contains a slightly greater percentage of oil, in proportion to the total weight, than the thick shelled fruit, but the average percentages of shelled kernels are fairly similar. This is not always the case, however, and it cannot be said that there are any especially rich or poor varieties of oil palm, either in respect of content of palm oil or of kernel.

High yield—of either palm oil or of kernel or of both—in proportion to the weight of the fruit, is an individual characteristic which is more frequently found among thin shelled than among thick shelled varieties; consequently even the former require careful selection for the purpose of estate planting.

The variety *macrocarya* Becc, owing to the thickness of its shell and to its not being richer in oil or in kernel than other thick shelled varieties, is not considered suitable for estate planting, but the crossing of this variety

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*An abstract of "Contribution à l'élude des Fruits des Variéties de Palmiers à Huile et leurs Huiles", by Prof. C. de Mello Geraldes with the collaboration of Candido Duarte and Frederico Gouveia. *Anais do Instituto Superior de Agronomia* —Vol. III Lisbonne, 1929.

with thin shelled varieties is recommended as it might result in a new type with thin shelled fruit of large size and a high percentage of oil and kernel.

There are great differences in the proportions of water, oil and residue of the pulp of the fruit of each variety, among its fruits themselves, but the averages for these varieties differ very little. The apparently superior percentage of oil in *repanda* A. Chev. is not considered reliably proved. The oils may, however, differ in properties.

The above also holds good for the oil percentage of the kernels. Within each variety the differences are large although not quite as large as those of the oil content of the pericarp. The averages for the varieties, however, differ very little. These oils too may differ in properties.

There is no correlation between the weight of the fruits and their oil or kernel percentage, in proportion to total weight. Neither is there a correlation between the thickness or the percentage of the pulp and the palm oil percentage in proportion to total weight. The differences in oil percentage of the pulp are very large among the fruits of any single species. The figures for *communis* A. Chev. type *tenera* shew that often the pulp of the fruits that have the smaller pulp percentage has a superior oil percentage.

It would seem as if in *intermedia* A. Chev. the palm oil percentage, in proportion to the total weight, increases with the pulp percentage, but this exception has yet to be reliably proved.

There is also no correlation between the pulp percentage of the fruit and the water or residue percentages of the pulp.

The conclusion is reached that for selection as well as for factory control the only standard of comparison to be recommended is direct determination of the oil content of the pulp.

There is no correlation between the content of palm oil and of kernels in proportion to total weight: between the percentages of pulp and of kernels in proportion to total weight: between the oil percentages of the pulp and of the kernels: or between the weight of the kernels and their oil percentage. Owing to the absence of such correlations, sound selection work requires many determinations in the laboratory of physical and chemical properties.

It should, however, theoretically be possible to breed an oil palm variety having a high yield of palm oil and kernel and a high percentage of oil in the kernel. Even if the ideal type is not so evolved, selection is certain to lead to a general improvement.

According to natives of different parts of Africa, the palm oil from fruit of varieties of the sub-species *virescens* is inferior to that obtained from fruit of the *nigrescens* sub-species. The former are said to be injurious to health. This might be worth closer investigation and it would be interesting to know the opinion on this point of margarine manufacturers. Apart from this consideration, it seems to be decidedly preferable to plant *nigrescens* varieties only as the *virescens* varieties have not proved to be superior in respect of the palm oil content or of the kernel content of the fruit.

NATIVE RUBBER CULTIVATION IN THE NETHERLANDS EAST INDIES.

The Dutch Official publication "Korti Berichten" of October 31st, 1930 contained the Fifth Report on Native Rubber Cultivation for the first Half Year 1930, by the Division of Agricultural Economics of the Agricultural Information Service. A translation of this paper by the British Consul-General, Batavia, has just been received. The following Abstract is prepared from the translation.

Under the pressure of low prices for rubber, the Government of the Netherlands East Indies decided to associate itself with the proposal for the cessation of tapping during the month of May and to explain the plans to the natives, with a view to bringing about voluntary co-operation between them and the European producers.

The nationalist press declared against co-operation, thinking to stir up on this score strife between the European and Native rubber industries in which the former would get the worst of it.

Native rubber planters viewed the situation from a purely economic aspect, attaching more importance to immediate advantages or disadvantages than to future expectation. The more important estate owners in Tapanoeli, the Southern and Eastern Division of Borneo and other places who were unable to work their plantations exhaustively with paid labour with low prices for the product, welcomed the proposal as participation in the plan meant to them an insignificant loss.

The small plantation owners, however, were not in favour of May restriction which they felt would deprive them of their earnings and would only bring vague advantages. The mass of small plantation owners have not participated in the restriction and it is felt that it would be difficult to induce them to embark on voluntary restriction.

At an influential meeting in May an alternative scheme was propounded viz. the voluntary co-operation of all rubber provinces on the ground of equality. Further consideration of the scheme brought to light insurmountable difficulties and it was therefore decided to approach Government with the request to change over to general legal measures of restriction as the only means of overcoming them. The decision of the Government was to the effect that it would support with advice any endeavours towards voluntary co-operation of producers but for the present at least did not feel obliged to take any legal measures of restrictions. The pronouncement was in line with the decision of the Government of Malaya after Sir Cecil Clementi's visit to the Governor-General of the Netherlands East Indies, from which it is definite that the position will be left to find its own salvation.

Supposing that the present low prices ruling will be maintained for the time being, it is therefore important to investigate what can be expected of native

rubber cultivation during the period when prices are left adjust themselves to economic conditions.

The export (in dry equivalent) of native rubber during the first seven months of 1930 was 59,582 tons as against 66,138 tons in 1929, a decrease of 6,500 tons or about 10%. The export figures for the first three months of 1930 were practically the same as for the corresponding period of the preceding year; during the succeeding months of 1930, however, the exports have steadily fallen much lower than those of 1929. The decrease is due not to the May restriction but to the suspension of tapping activities owing to the low rubber prices.

Against this fall in production stands a sharp increase in the productive area due to the fact that the large extensions in 1924 and 1925 have, to a great extent, reached a tappable age. The fact that the output has not increased by this is due to the decrease in production of the large plantations, which find more and more difficulty in obtaining tapping coolies. With the exception of the delta territories of the Western Division of Borneo, the exploitation of the large estates with coolies who receive 50 per cent. of the rubber tapped is little practised these days. A number of such estates have now altogether ceased tapping.

On the basis of the export figures available, views of a more or less speculative nature can be given on the anticipated output of native rubber taking it on the very low price unit of twenty cents (Dutch currency) per half kilogram which the market has now reached.

From a comparison of the prices of wet rubber in several places in the Outer Possessions with the prices of medium blanket at Singapore the impression is obtained that the fall in price of wet rubber is somewhat slower than that of blanket but that the average price curves tend to converge. This is to be explained by the fact that the difference between the price curve is caused *inter alia* by the water-content of the rubber and the export duty (which rises and falls with the value of the product). The fairly constant factors arising from the difference in price between the qualities are then, cost of transport, trade profits and cost of preparation of the product.

From these considerations it is clear that with the continued drop in price, the average price curve for wet rubber will strike the zero line somewhat earlier than will that of blanket quotations. In July prices for wet rubber oscillated between five and ten cents per half kilogram from a standard quotation of twenty-eight and one-half cents. The price of the last quality is now about twenty cents. Extensions of the price curves of the wet product make it appear very probable that already native rubber in unfavourably situated places in the interior is practically worthless. Further price reductions will extend the area where no native rubber can be produced at a profit until at a price around twelve cents the greater part of native rubber areas will go out of production.

Where most of the plantations will cease production before the value of rubber reaches zero, it may be taken for granted that already production has been seriously curtailed, whereby a notable shrinkage in exports must occur in the coming months.

These anticipations concerning output have been realised up to the end of September, during which month the price of twenty cents per half kilogram was reached. During this month the export of native rubber fell to a very low level. Although this can partly be ascribed to exhaustion of accumulated stocks, it can be safely said that the fall in output was one of the principal causes.

Under the guidance of the officer of the Government in their territory and the Agricultural Service the natives in the greater part of the Outer Possessions are adapting themselves to the new conditions brought about by the loss of a good portion of their earnings. By means of giving greater attention to the cultivation of vegetables the shock resulting from the collapse in rubber prices will not be so severely felt in many places as one might be inclined to suppose.

Reviews.

The Export Crops of the Netherlands East Indies in 1929.

Bulletin No. 86 of the Central Bureau of Statistics, Department of Agriculture, Industry and Commerce, Buitenzorg, August, 1930.
pp. 266. Price 6 shillings.

This publication gives an adequate review of the agricultural prosperity of the Netherlands East Indies as represented by the surplus products that are exported. The table given below shows the enormous increase in their total value and of the country's contribution to the world's requirements during the period 1894-1929. The rise and decline of the world's prosperity during the last 5 to 6 years of that period is reflected in these figures, the peak having been reached in 1925. In these fluctuations important parts are played by prices for Java sugar and for rubber from Java, Sumatra and Borneo.

Export of agricultural products from estates and from native agriculture in millions of guilders.

Year	Java			Outer Possessions			N. E. I.		
	Estates	Native	Total	Estates	Native	Total	Estates	Native	Total
1894	110	7	123	21	10	31	137	17	154
1898	115	5	120	22.5	10.5	33	137.5	15.5	153
1902	123	13	136	23	24	47	146	37	183
1906	148	16	164	21	27	48	167	43	212
1910	187	34	221	18	42	60	205	77	282
1913	231	43	274	70	55	125	301	98	399
1917	339	31	270	89	54	143	428	85	513
1921	516	65	581	133	101	234	649	166	815
1922	400	46	446	121	117	238	521	163	684
1924	675	77	752	205	222	427	880	299	1179
1925	625	101	726	300	429	729	925	530	1455
1926	541	76	617	276	324	600	817	400	1217
1927	604	81	685	284	323	607	888	404	1292
1928	583	135	718	225	294	519	808	429	1237
1929	484	104	588	204	291	495	688	395	1083

The increasing importance of native cultivation in relation to the total value of all produce exported from the Dutch East Indies is shown by the table given below.

Estate-produce and Native-produce exported in percentages of total value of all Exports.

Year	Java		Outer Possessions.		N. E. I.	
	Estates	Native	Estates	Native	Estates	Native
1894	94.3	5.7	67.7	32.3	89.	11.
1898	95.8	4.2	68.3	31.7	89.9	10.1
1902	90.4	9.6	48.7	51.3	79.7	20.3
1906	90.2	9.8	43.5	56.5	79.7	20.3
1910	84.3	15.7	30	70	72.7	27.3
1913	84.5	15.5	57.7	42.3	75.5	24.5
1917	91.6	8.4	62.4	37.6	83.1	16.9
1921	88.8	11.2	56.9	43.1	79.7	20.3
1922	89.6	10.4	50.9	49.1	76.2	23.8
1924	89.8	10.2	48	52	74.6	25.4
1925	86.1	13.9	41.2	58.8	63.6	36.4
1926	87.7	12.3	46	54	67.1	32.9
1927	88.2	11.8	46.8	53.2	68.7	31.3
1928	81.2	18.8	43.4	56.6	65.3	34.7
1929	82.3	17.7	41.2	58.8	63.5	36.5

The great recovery of the importance of the estate produce—especially in Java—during and for some time after the war is interesting. Also the increasing importance of the native produce from the Outer Possessions during the period 1902—1910 and since 1917, the latter probably chiefly due to rubber.

The proportion supplied from the Netherlands East Indies was, stated in percentages of the world's exports:

	1927	1928
	Per cent.	Per cent.
Rubber	38	35
Sugar	10	11
Coffee	6	8
Tea	16	17
Cinchona	91	93
Copra, oil, etc.	23	30
Palm oil, kernels	3	4
Fibre (sisal, cantala & magey)	19	19
Coca leaves	58	?
Kapok	76	79
Pepper	53	70

In nearly every case the percentage for 1928 shows an increase over that of 1927. A notable exception is that of rubber. An increase in the price of rubber would, however, probably again cause a large increase of the output of native rubber.

The list given above does not exhaust the number of crops successfully grown in the Netherland East Indies and for which there is a considerable export trade.

The area planted with the principal crops, with one notable exception, increased in 1929. The exception is tapioca; no reliable figures for the, by no means negligible, estate area harvested are to hand but the native area harvested in 1929, is given at 1,755,466 acres, or 108,051 acres below the average for the years 1921/28. During the last 9 years the area planted has varied greatly; it was lowest in 1926—1,679,876 acres—whereas it was highest in 1927—2,037,702 acres—or 357,826 acres = 21½ per cent. larger than the previous year.

The area and production in 1929 of some of the important crops are given below in acres and in tons of 2,240 pounds:

Rubber:

Hevea Estates, planted	1,353,040	acres	
,, in bearing	890,750	,,	151,726
,, Native	?		106,874
Ficus	?		133
		Total production	258,733 tons.

Cane Sugar:

Estates	472,850	acres
*Native	37,945	,,
	510,795	acres

†Total production 2,855,453 tons

* part of the cane is sold to the factories, remainder consumed locally.

† factory-produce only; includes part of native cane-crop, bought by the factories.

The bulk of local native consumption is supplied from native manufacture of cane-sugar and palm-sugar.

Coffee:

*Estates, planted	318,352	acres	
in bearing	233,242	,,	54,410
Native	?		57,629
		†Total export	112,039 tons

* Includes areas with mixed crops.

† Not including local consumption.

		Planted Acres	In Bearing Acres		
Robusta:	Estates	291,554	214,512	51,697	
	Native	?	?	51,283	102,980
Liberia:	Estates	5,800	4,087	619	
	Native	?	?	29	648
Arabica	Estates	13,615	9,837	1,494	
	Native	?	?	6,310	7,804
Other	Estates	7,383	4,806	600	
	Native	?	?	7	607
Total Estates		318,352	233,242	Total Export	112,039 tons

Tea:

Estates	297,620		*58,883
Native	92,600		15,510
Total area	390,220 acres	Total production	74,393 tons

* Includes produce made from leaf bought from native growers.

Tobacco:

				Leaf	Krossok
Estates, Java	68,542		*Estates, Java	21,290	
Sumatra	51,800	120,342 acres.	*Sumatra	19,060	
			*Java		16,932
Native Java	361,653		Native, Java		31,101
Other	?	?	†Total export tons	40,350	48,033

Includes produce made from leaf bought from native growers.

"Krossok" is the low grade tobacco—damaged leaves, cuttings, clippings, leavings, pickings etc.—that is cut up for pipe-tobacco etc. and used for cigar-fillings.

† The figure for total export does *not* include local consumption, no figure is given for total production.

Cinchona:

	Planted Acres	In Bearing Acres		
Estates	47,886	37,923	Total production	11,697 tons dry bark

Coconuts:

	Planted Acres	In Bearing Acres	Copra & Copra-equivalent of Oil	
Estates	127,667	66,434	*26,446	tons
Native	?	?	474,337	,,
			†Total Export 500,783	,,

* Includes 2,354 tons, made from nuts bought from native growers.

† This figure does not include the local native consumption which for 1928 was estimated at 356,300 tons for Java alone and in proportion to population may be about 140,000 tons in the Outer Possessions.

Essential Oils:

	Planted Acres	In Bearing acres		
Estates	26,774	22,543	424.5	tons
Native	?	?	609.5	,,
			Total Export 1,034	tons

Oil Palm :

	Planted Acres	In Bearing Acres	Production	Export
Estates, Java -	1,643		Oil 35,404	35,312 tons
,, Outer -			Kernels 6,954	6,729 ,,
Possessions	140,963			
	142,606	58,003		

Fibres :

	Planted Acres	In Bearing Acres	
Estates -	38,753	28,093 acres	15,805 tons
Native -	?	?	41,957 tons
		Total Export	57,762 tons

Kapok :

	Planted Acres	In Bearing Acres	Kapok	Seeds	Oil	Seedcake
Estates -	37,847	17,586	1,784	3,168	—	—
Native -	?	?	15,667	4,662	1,371	17,264
	Total Export tons		17,451	7,830	1,371	17,264

Coroa :

	Planted Acres	In Bearing Acres	Export
*Estates -	12,728	10,606	1,136 tons
Native -	?	?	135 tons
		Total Export	1,271 tons

* About 78 per cent. of this area is planted with mixed crops.

Pepper :

	Planted Acres	In Bearing Acres	Export
*Estates -	3,340	2,387	156 tons
Native -	?	?	27,591 tons
		Total Export	27,747 tons

* About 82½ per cent. of this area is planted with mixed crops.

Tapioca :

	Export.					
	Crude Dry Tubers	Ground Dry Tubers	Flour	Flake	Pearl	Ampas
Tons	20,065	98,075	114,918	6,824	18,755	7,389

No reliable figures of the estate area can be given. Figures for the native area for 1921/9 have been given above.

Coca-Leaf :

		Planted Acres	In Bearing Acres	Production
Estates	-	2,627	2,560	478 tons

Nutmegs :

		Planted Acres	In Bearing Acres	Export Nuts	Unshelled nuts	Mace
*Estates	-	5,115	4,095	496	—	89
Native	-	?	?	937	2,380	591
			Total Export	1,433	2,380	680

About 44 per cent. of this area is planted with mixed crops.

Gambier:

		Planted Acres	In Bearing Acres	†Export
*Estates	-	6,550	5,760	4,274 tons
Native	-	?	?	9,170 tons
				13,444 tons

* About 38 per cent. of this area is planted with mixed crops.

† No gambier is grown in Java which for its requirements depends on supplies from Sumatra, Riow and Borneo. The total export includes the exports to Java. The extent of local consumption is unknown.

Gutta Percha :

	Export
From Java	67 tons
From Outer Possessions	2,640 tons
	2,707 tons

Practically all getah is forest produce from the Outer Possessions. There is one estate of 2,768 acres planted and in bearing in Java and two small estates in Sumatra, together 407 acres planted but not yet in bearing.

In addition to the above crops which are mainly produced for export, vast areas in the Netherlands East Indies are under crops grown for local consumption, making the country to a large extent self-supporting in the matter of food supply.

Chief of these food crops are:—

Wet padi	...	7,382,193	acres;	crop 6,119,325	tons
Hill padi	...	1,077,187	,,	,, 531,496	,,
Maize	...	4,212,580	,,	,, 1,555,511	,,
Cassava (tapioca)	...	1,755,466	,,	,, 5,048,130	,,
Batatas	...	324,726	,,	,, 909,055	,,
Other tubers	...	279,841	,,	,, ?	,,
Groundnuts	...	525,382	,,	,, 153,740	,,
Soya-beans	...	435,189	,,	,, 104,921	,,
Other beans	...	482,097	,,	,, ?	,,

These figures refer to Java and Madura only; for the Outer Possessions no reliable figures are available. The crop figures for cassava and batatas are given in weight of dry tubers.

Examining these figures for areas planted and crops produced, one realises that the native production in many directions is of considerable importance, not only in the matter of such crops as padi, tapioca, coconuts and other food-crops, but also in respect of such crops as rubber—of which native produce to the extent of 106,875 tons dry equivalent was exported from Sumatra and Borneo in 1929—and tobacco and sugar cane of which there were respectively 361,653 and 37,945 acres under native cultivation in Java in 1929. In respect of coffee, kapok, pepper and gambier, native production supplied respectively about 50, 80, 99 and 68 per cent. of the totals exported after satisfying local requirements.

To what extent in the Outer Possessions the growing of export crops for the world market has increased in the last few years at the expense of the former customary cultivation of food-crops for local consumption, is indicated by the following figures for the surplus of imports over exports of husked rice for the Outer Possessions only:

1925	...	...	298,521 tons
1926	...	...	338,986 ,,
1927	...	...	366,166 ,,
1928	...	...	409,356 ,,
1929	...	...	396,060 ,,

The decrease in 1929 obviously is due to the decline of the price of rubber and consequent diminution of the purchasing power of the rubber producing population and their return to rice cultivation. For the chief native rubber producing countries—Riow, Jambi, Palembang and Borneo—in 1929 imported 115,991 tons of rice as against 146,588 in 1928, equivalent to 29.3 and 35.8 per cent. of the totals for the respective years.

The decrease of 30,597 tons may to a large extent be due to a probable large decrease of the number of wage-earning native tappers that are attracted to these countries from Java and adjacent territory in large numbers during periods of high rubber prices and leave again when tapping on an output sharing basis no longer pays.

A native rubber output of 106,874 tons dry weight would, at an output of 1/3 ton dry weight per tapper, require a permanent labour force of roughly 320,000 tappers. As not over three quarters of all native rubber comes from the countries mentioned, these countries employ roughly 240,000 tappers.

The labourers from outside are practically all men unaccompanied by dependents. Taking the average consumption of rice by such a labourer—including dependents if any—at 500 pounds a year, a quantity of 30,597 tons of rice represents the food for 137,000 men. The proportion of foreign labour to total employed in 1929 was certainly much below 137,000 to 240,000 among an indigenous population of about 3,750,000. So there would appear to have been a partial return to the growing of foodcrops.

Of the 1929 total of 396,060 tons of imported rice not less than 177,823 tons = 45 per cent. was imported by the Residency "East Coast of Sumatra", the centre of the large-scale capitalist rubber, tobacco and oil palm cultivation, employing practically exclusively imported labour. Banka and Billiton, which are practically entirely given to tin mining with imported labour, in 1929 imported 49,000 tons = 12⅓ per cent. of the total.

L. A. J. R.

Information Cards for Rubber Estate Factories.

The Rubber Research Institute of Malaya has recently published fifteen Information Cards which should prove of great value for general reference in rubber estate factories. The subjects of these cards include:—directions for coagulating latex; sodium sulphite; sodium bisulphite; para-nitrophenol; defective rubber sheet—bubbles, pitted surface, rust, greasy surface, dark patches, spot disease in pale crepe rubber; directions and table for standardising latex; directions for determining the dry rubber content of latex; table showing relationship between dry rubber content of latex and its specific gravity.

The cards are contained in a stiff cover supplied with two hinged rings so that further cards can be inserted when published. It is understood that the issue of further cards is contemplated. On application to the Director, Rubber Research Institute of Malaya, Kuala Lumpur, the cards will be sent free of charge, and applicants' names will be noted for the free supply of future issues of cards. The cost of the cover is thirty-five cents (Straits Settlements currency).

A NOTE ON THREAD BLIGHT OF COFFEE

BY

A. Thompson,
Ag. Government Mycologist.

An interesting specimen of a disease of Coffee was received in August 1930. It was the affection known as Thread Blight, so called by reason of the narrow strands of white mycelium which run along the branches and leaves, often binding the leaves together.

A similar type of disease is known on Hevea and camphor in Malaya and Java, and it has also been reported on other hosts including pepper and coffee in Java and on tea in India. A thread blight also occurs on a number of fruit trees in Malaya and is frequently found on jungle plants.

Recent work on this disease (1) has shown that there are two groups of fungi which form "Thread Blights"—the Marasmioid group and the Corticium group. It is possible to distinguish these two groups by the characters of the hyphae which compose the strands. The hyphae in the coffee specimen referred to above were moderately thick walled with few septa; numerous "anchor" cells were present. For this reason the fungus is included in the Marasmioid group with "anchor" cells, and is thus similar to the fungus described on coffee in the Dutch East Indies (2), but differs from the Malayan "Thread Blight" fungus on Hevea which has no "anchor" cells.

The effect of the disease is to cause browning and death of the leaves followed by death of the branches, and on the specimen examined the green berries were also somewhat affected, being discoloured where the mycelial strands ran over the fruit.

It is stated that the fungus is more commonly found in damp localities, or under shade where the humidity is high. The infection spreads when affected leaves come in contact with healthy leaves.

The usual treatment is to reduce shade, to cut out affected branches and to burn these along with all diseased leaves. The thicker branches should be painted with 3 per cent. Izal or 20 per cent. Agrisol or with lime-sulphur mixture.

The disease has not previously been noticed on coffee in Malaya, but it is unlikely to prove serious.

References.

(1) Petch, T. Ann. Roy. Bot. Gard. Peradeniya. Vol IX. 1924-25.

(2) Bally, W. Arch. voor Koffiecult. Nederl. Indie. III. I June 1929.

PRODUCTION OF WHALE OIL

At a recent meeting of the Agricultural Advisory Committee a request was made for further information on the whale oil industry. In response to this request, the following details have been compiled from various sources.

The increasing production of whale oil as well as of groundnuts and other oil seeds and nuts has an important bearing upon the copra position. This fact has been explained in an article which appeared in this Journal in February, 1930, and also in a report prepared by the Empire Marketing Board which was published in *The Tropical Agriculturist*, March 1930.

The steady increase in production shown below is further emphasised by the fact that the average annual production of whale oil between 1910—1920 was about 550,000 barrels.

The following is an abstract of a reply from the Empire Marketing Board to a recent enquiry for additional information on the production of whale oil.

The trade estimate of the quantity of whale oil coming on the market in recent years is as follows:—

Year.	Barrels.
1925	1,044,272
1926	1,166,857
1927	1,220,415
1928	1,356,308
1929	1,861,877

The quantities produced have been greatly increased in recent years on account of the great improvement in the methods employed in the whaling industry. Although no estimate is available of production in 1930, it is expected that heavy catches will continue unless they should result in too drastic depletion of the herds.

Owing to modern methods of treatment, a proportion of the oil can be made up into a non-odourous fat suitable for human consumption, but it is not possible to say what proportion of the whale oil available for world consumption is rendered available for edible purposes.

The following brief history of whaling and its future, was delivered by Professor A. C. Hardy in a recent wireless "talk".*

Every whale fishery has followed the same course—first a period of rapid development and profitable enterprise followed by collapse and final failure. By the fifteenth century the Basques had exterminated the Nordkarper whales from the Bay of Biscay—in the sixteenth century the Newfoundland fishery rose and fell. Then the Greenland whale was discovered and from the beginning of the

*From *The Listener*. October 1, 1930.

seventeenth century to the middle of last century a series of fisheries one after the other flourished and failed, first round the coast of Spitzbergen and Jan Mayen Land in the days of great competition between the English and the Dutch and then at Greenland and far up the Davis Straits to Baffin Bay. One by one the great British whaling ports gave up. Hull, once famous for its whaling, sent its last ship in 1869—and a few ships still sailed from Dundee till the beginning of the present century.

Just when it seemed that whaling in the north was dead, Svend Foyn, a Norwegian, in 1865 invented the modern harpoon gun. This opened up a new fishery, that of the great rorqual whales which had hitherto been too fast and powerful to be attacked. Then history repeated itself once more and for many years now only a few small stations have been operating in the north. It seemed that whaling was passing altogether from the world—but no.

Reports brought back by expeditions from the Antarctic showed that there were whales in the far south. In 1904 that great Norwegian whaling Captain—C. A. Lansen—established the first whaling stations in the south of South Georgia. In the following year floating factories visited the South Shetlands still farther south. So successful were these enterprises that by 1912 there were twenty-one whale catchers working in South Georgia and thirty-two in the South Shetlands. All these islands are part of the British Empire, being Dependencies of the Falkland Islands. The Government, realising the danger to the industry, limited the number of licences issued to the companies; but during the war when the oil became of great importance the restrictions were relaxed, and in 1915-16 the number of whales taken in a single season reached close on 12,000. If further regulations should become necessary to save the industry from decline, it was realised that it must be based on scientific knowledge. A Committee was set up with the result that the "Discovery" investigations were planned and are now being carried into practice under the leadership of Dr. Stanley Kemp. We knew practically nothing about the biology of these great whales, about their breeding habits, migrations, length of life, the time they take to reach maturity, and of the factors underlying the fluctuations in numbers from year to year. Knowledge of all these points and many others is of the utmost importance. Dr. Kemp and his staff are busy finding the answers to these questions, and much valuable information has already been obtained and is being published in the 'Discovery Reports'.

In the meantime new developments have taken place in the industry. Hitherto this whaling has been confined to shore stations or floating factories which must be anchored in the shelter of the land. A floating factory ship carries out all the operations just described, within her hull. The whales are flensed and cut up alongside—hence the necessity for calm water. But now in recent years a new type of floating factory has been evolved—it is known as a pelagic whaler, because it can carry out operations in mid-ocean. Huge jaw-like gates open in the bows or stern, revealing a sloping gullet from the

sea up to the deck. The whales brought in taken by the catchers are swallowed whole. 'Surely', as some journalist has aptly said, 'this is Jonah avenged'.

Whaling can thus be carried out without complying with local regulations. The number of whales being taken in the Antarctic is increasing every year; some forty thousand were killed during last season. The regulation of the industry of the future must depend upon international agreement, which is inevitably slow. Let us hope that it will come before it is too late. We need not fear the complete extermination of whales, because the industry is now carried out upon such a scale that it must fail before the whales are actually brought to extinction. But there is a very real danger if care is not taken, of a collapse of the industry, with the loss of this valuable supply of oil if not for ever, for a very long time to come.

INTERNATIONAL DIRECTORY OF PEDIGREE STOCK BREEDERS.

We have recently received a copy of the third edition, 1930—31 of the International Directory of Pedigree Stock Breeders, published at 23, Fleet Street, London, E.C.4 at thirty shillings. It is essentially a register of breeders of pedigree farm stock, bloodstock, kennel-registered dogs and pedigree poultry in Great Britain and Ireland, the British Dominions and Colonies and in many other countries. The book also contains other information on stock in many countries and is suitably illustrated.

FROM THE DISTRICTS.

The Weather.

In most parts of the country the month was wet, rainfall being well distributed. In Malacca, however, the weather was fairly dry with occasional heavy storms, while in Pahang some districts received much less rain than others.

Remark on Crops.

Rubber.—There was a slight rise in the price of rubber, smoked sheet from small holdings selling for $13—$18 and unsmoked sheet for $10—$16 a picul. In Singapore the number of small holdings not tapped is increasing while in Negri Sembilan tapping has been resumed on a few holdings. Elsewhere there have been no changes worthy of record.

As was to be expected during the continued wet weather, Mouldy Rot disease has been much in evidence.

Padi.—With an adequate water supply for two months the prospects for the coming padi harvest have greatly improved and at present satisfactory or good crops are expected in most cases. Harvesting was in progress in Temerloh District of Pahang and had commenced in one locality in Selangor. Minor floods did a little local damage in various parts of the country. Some good crops of dry padi were harvested in Kedah and Selangor. The dry padi areas in Perak South and Pahang West have not yet been reaped.

In certain localities in Kedah and Province Wellesley where the water was deep, the caterpillars of the small moth *Nymphula depunctalis* proved troublesome as a minor pest, since the deep water renders control difficult. The leaf hopper, *Sogata pallescens*, appeared again in a few localities in Krian and Kuala Kangsar Districts, damaging an area of 150 acres of padi in Krian. Stem borers did some damage in Selangor and the padi fly *Leptocorisa acuta* was also found in several localities but did not occasion much loss.

Food Crops.—In Kedah attention continued to be given to the planting of food crops which include an area of about 35 acres planted with the Bambarra groundnut in Kulim District.

Fruit.—In Klang and Kuala Langat Districts of Selangor local fruit trees were in bearing including durians, rambutans and pulasans. Crops, with the exception of durians, were poor and prices not attractive. In the inland Districts fruits were not yet ripe. In Pahang West further small supplies of the same fruits ripened in Raub and Bentong Districts. In Seremban District there was a good crop of bullock's Heart (*Anona reticulata*) and a small crop of durians, but the quality was poor.

Pineapples.—The supply of pineapples in Singapore island has been quite insufficient to keep the five factories working. The price paid for fresh fruit delivered at the factory ranged from 80 cents to $1.20 a hundred and provided little encouragement for increasing the planted area.

Cloves.—The clove harvest in Penang commenced during the month. Dried cloves were selling at $40 a picul as compared with $60 in 1929.

Other Crops.—In Batang Padang District of Perak considerable interest is being taken by small-holders in crops such as coffee, tuba, bananas and tobacco. Certain newly alienated lands have been planted in an orderly manner with the first three crops mentioned. It would appear that this is in a great measure due to the lectures which have been given on various subjects and to the policy adopted of getting in touch with successful applicants for land.

Notes on Demonstration Station and Padi Test Plots.

Kedah Rice Experiment Station.—The plots were weeded and supplied. The plants continued to make satisfactory growth.

Glugor Padi Test Plot, Penang.—The work of preparing the land proceeded rapidly and all varieties, except the short period padi, Radin Siak, had been planted out at the end of the month. Heavy rains did slight damage to one or two plots. Rats and the insect *Scotenophora coarctata* also did slight damage in one or two plots, but control measures were successful.

Bukit Merah Padi Test Plots, Province Wellesley.—Planting was completed during the month and the station looked remarkably well. The water supply was ample.

Seremban Fruit Nursery.—Two beds were planted with carpet grass to produce cuttings for School Gardens from which there is an increasing demand. A row of pomegranates was planted out and the planting of cover crops was continued. *Centrosema pubescens* and *Calopogonium mucunoides* were cut and used as a mulch round the citrus trees after the ground had been forked. The growth of the recently planted Salisbury White Sweet Corn was good.

Kuala Lipis Demonstration Station.—A few seedlings of a considerable number of different fruit trees were planted out. Marcots were made from the grape fruit trees and all the plants on the plot of citrus trees were pruned. Of food crops, plots of two varieties each of maize, groundnuts, soya beans and sweet potato were planted.

Sungei Ledang Demonstration Station, Malacca.—Felling was completed and preliminary plans for the layout of the station were drawn up.

Pineapple Demonstration Station, Singapore.—Clearing, fencing and roading of this station was commenced. Arrangements were in progress for the erection of the buildings.

Rat Destruction.

In Province Wellesley payments were made for 271,506 rat tails, bringing the total number of rats accounted for during the year up to 1,294,916. The number of baits distributed was 27,235. In Krian rewards were paid for 563,579 tails making a total for the year of 1,757,735. In Malacca 29,534 tails were paid for.

In many places rats are far more numerous than usual, so that in spite of the large numbers destroyed, some damage has been caused to padi in Krian and in localities adjoining uncleared land in Province Wellesley North.

DEPARTMENTAL NOTES.

The Director of Agriculture visits Pahang and Johore.

The Director of Agriculture toured Pahang and Johore in connection with the investigations of the Rice Cultivation Committee from November 6th—11th inclusive.

Visits to the Department.

Mr. C. F. Pemberton, Chief Entomologist, Sugar Planters' Association of Hawaii arrived in Malaya about the 8th August, with a view to finding and then introducing into Hawaii parasites to control some sugar cane insect pests. He has been stationed at the Government Experimental Plantation, Serdang, since his arrival. Mr. Pemberton has been successful in obtaining an egg parasite of a grasshopper—*Oxya chinensis*—and it is understood has already sent shipments of the parasite to Hawaii where this grasshopper has caused some damage to the crop.

Mr. H. J. Page, Senior Chemist of Imperial Chemical Industries Ltd., visited the Department in November. Mr. Page is touring the Peninsula with a view to studying the local demand for chemical manures.

Dr. (Miss) Müller of the Biolaboratorium, Oppau, Baden, Germany, visited the Department of Agriculture at Kuala Lumpur on October 30th and 31st, 1930. Dr. Müller is on an official tour studying economic food crops with special reference to a botanical survey of Soya Bean.

Mr. E. A. Curtler's visit to India and Ceylon.

Mr. E. A. Curtler, Assistant Agriculturist, returned to Malaya on 20th October, 1930, after a six months' tour in India and Ceylon, which was undertaken for the purpose of studying tea cultivation as practised in those countries. It is hoped to publish in this Journal Mr. Curtler's observations on the subject of his investigations.

Appointment.

Mr. B. A. Lowe, B.A., was appointed an Assistant Economic Botanist, Department of Agriculture, S.S. & F.M.S. on 16th October, 1930. Mr. Lowe reported for duty on 13th November, 1930.

Leave.

Mr. F. R. Mason, Agricultural Field Officer (Province Wellesley and Penang) has been granted seven months and twenty-six days leave on full pay, with effect from the 20th November, 1930, inclusive.

Mr. J. Fairweather, Agricultural Field Officer (Malacca) returned from leave of absence on 8th November, 1930. Mr. Fairweather proceeded to Butterworth on 17th November to take over the duties of Mr. Mason during the latter officer's absence on leave.

MARKET PRICES.

November, 1930.

Rubber.—The average price in Singapore was 14.2 cents per lb. against 12.6 cents in October. The average London price for November was 4.4d. compared with 3.96d. for the previous month.

Palm Oil.—Market quiet. London advised on 27th November that the price on that day was £16.15.0 per ton, on a basis of 18% F.F.A.

Copra.—Firmer. Singapore average prices for November: Sundried, $6.32½; Mixed, $6.00; Cake, $1.75 per picul. Corresponding prices in October were $6.22; $6.01; $1.75.

Gambier.—Demand negligible. Average Singapore prices: Block, $9.08; Cube, $14.25 per picul against $9.37½ and $14.25 respectively in October.

Nutmegs.—Market has declined, but is fairly steady at lower prices. Average Singapore prices for November: 110's $26.87½; 80's $31.12½ per picul against $29.40 and $32.70 respectively in October.

Mace.—Average Singapore prices: Siouw, $83.12½; Amboina, $60 compared with corresponding prices for October of $90.50 and $67.50 per picul.

Pepper.—Market firm and considerable business passing. Average prices for November: Singapore Black, $23.75; White, $39.50; Muntok, White, $41.37½ compared with $24.80; $39 and $41 per picul respectively in the previous month.

Sago.—Steady. Average Singapore prices for November: Flake, small, fair, $6.50; Flour, Sarawak, fair, $3.05 per picul against $6.19 and $2.99 respectively in October.

Tapioca.—Market firmer. November average prices in Singapore were:—Flake, Small fair, $4.47½; Pearl, seed, $5.81; Pearl, Medium, $6.50. Corresponding prices for October: $4.24; $5.65; $5.95 per picul.

Pineapples.—Very little business passing. Average Singapore prices per case in November: 1½ lb. cubes, $3.28; 1½ lb. flat, $3.18¾; 1½ lb. tall, $3.65 compared with $3.40; $3.34; and $3.76 respectively in October.

The above prices are based on London and Singapore quotations for rubber and on the Singapore Chamber of Commerce Market Reports published in November. Palm oil quotations are kindly supplied by Messrs. Lewis and Peat (Singapore) Ltd.

1 picul = 133 1/3 lbs.

The dollar is fixed at two shillings and four pence.

MALAYA RUBBER STATISTICS.

STOCKS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, HELD BY DEALERS AND ESTATES OF 100 ACRES AND OVER, THE DECLARED PRODUCTION OF THE SAME ESTATES, IMPORTS AND EXPORTS, AND THE ESTIMATED PRODUCTION OF ESTATES OF LESS THAN 100 ACRES, FOR THE MONTH OF OCTOBER 1930, IN DRY TONS.

Territory	Stocks at beginning of month			Production by estates of 100 acres and over		Production by estates of less than 100 acres (estimated)		Imports				Exports (including re-exports)				Stocks at end of month		
	Ports	Dealers	Estates of 100 acres and over	during the month	during the year 1930	during the month	during the year 1930	during the month		during the year 1930		during the month		during the year 1930		Dealers	Estates of 100 acres and over	Ports
								Foreign	From Malay States	Foreign	From Malay States	Foreign	Local	Foreign	Local			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
MALAY STATES																		
Federated Malay States	...	10,594	15,959	12,701	114331	8,108	93,055	Nil	7	Nil	59	16,003	6,083	153923	54,953	10,036	15,247	...
Johore	...	2,013	5,040	4,019	35,293	4,096	39,215	Nil	5	Nil	19	1,362	6,808	10,634	64,845	2,196	4,807	...
Kedah	...	436	2,208	2,196	19,436	1,067	12,008	Nil	Nil	30	Nil	892	2,239	7,568	23,863	464	2,312	...
Perlis	...	10	8	7	81	15	129	Nil	Nil	Nil	Nil	Nil	21	Nil	223	10	9	...
Kelantan	...	182	158	226	2,511	425	3,809	2	Nil	33	Nil	114	548	742	5,639	163	168	...
Trengganu* ...	...	55	50	97	1,148	48	573	Nil	Nil	Nil	Nil	Nil	145	Nil	1,722	55	50	...
STRAITS SETTLEMENTS																		
Malacca	...	2,606	1,957	1,362	12,010	†		Nil	3,243	Nil	18,835	5,578		40,591		2,516	1,907	...
Province Wellesley	...	131	709	542	4,596											117	686	...
Dindings	...	89	145	93	975	1,086	31,217	393	3,118	7,256	33,201	5,896	Nil	56,140	Nil	96	117	...
Penang	1,876	5,266	15	8	102											4,136	13	1,258
Singapore	4,954	28,526	324	224	2,278			5,683	9,471	87,202	99,131	18,064		202,363		27,614	347	3,476

ANALYSIS OF COLONY, FEDERATED MALAY STATES AND JOHORE DEALERS' STOCKS AT END OF MONTH, IN DRY TONS

Class of Rubber	Federated Malay States	Singapore	Penang	Province Wellesley, Dindings and Malacca	Johore	Gross total
(20)	(21)	(22)	(23)	(24)	(25)	(26)
Smoked sheet ...	7,217	15,121	2,467	1,664	970	27,439
Crepe	572	10,477	1,128	723	255	13,155
Unsmoked sheet ...	1,220	2,016	541	342	578	6,117
Scrap and lump ...	1,027				393	
Total all Grades ...	10,036	27,614	4,136	2,729	2,196	46,711

Notes.—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month; i.e., Column (7) = Columns (13) + (14) + (17) + (18) + (19) — (2) — (3) — (4) — (5) — (6) — (10)

3. Colony Dealers' Stocks are as published in Return I. & E. 6, dated 10 November, (S. S. *Gazette* Not. No. 2350), being dry weight as estimated by Dealers themselves.

4. Malay States Dealers' Stocks are reduced by the following fixed ratios: Unsmoked Sheet, 15%; Wet Sheet, 25%; Scrap, Lump, etc., 40%.

5. Foreign Imports are as published in Return I. & E. 5, dated November 3, (S. S. *Gazette* Not. No. 2285), foreign wet imports being reduced to dry weight by 25 per cent.

6. Foreign exports of each State and Settlement are those published in the Malaya Monthly Trade Return (Appendix II), and are distinct from Ocean-Shipments as published in Return I. and E. 4, dated November 4, *Gazette* Not. No. 2282 Appendix IV to Monthly Trade Return).

*7. Stocks and production in Trengganu are estimated from figures supplied by the Commissioner of Lands.

8. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication, therefore, is always the most reliable.

†9. This hypothetical figure, based on the formula quoted in Note 2, contains whatever errors exist in the Columns comprising it and may therefore be expected to fluctuate from month to month. A truer indication of production will be the monthly average over as long a period, for which figures can be estimated, as possible.

Singapore, November 19, 1930.

J. I. MILLER, M.C.S.,
Acting Registrar-General of Statistics, S.S. and F.M.S.

SUMMARY OF PADI REPORTS, FEDERATED MALAY STATES, STRAITS SETTLEMENTS AND KEDAH FOR THE MONTH OF OCTOBER, 1930.

State	District	Acreage of padi land	Acreage planted	Percentage 4 to 3	Gross crop	Crop per acre 6 to 4	Remarks
		Acres	Acres		Gantangs		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Perak	Perak North :						
	Krian	53,250	...	...	...	...	About 20,000 acres planted.
	Larut	8,525	...	...	...	...	Planting nearing completion.
	Selama	3,450	...	...	...	...	Planting nearing completion.
	Kuala Kangsar	13,997	...	...	...	...	Planting nearing completion.
	Upper Perak	3,739	...	...	...	...	Planting practically completed.
	Perak South :						
	Eight mukims	14,817	...	...	...	...	Planting completed in four mukims. Menajak in process in the rest.
		97,778	...	...	...	...	
Selangor	Ulu Langat	2,670	...	...	...	...	Flowering commenced.
	Kuala Lumpur	797	...	...	...	...	Flowering commenced water drained off in S. Buloh.
	Ulu Selangor	1,205	...	...	...	...	Flowering commenced.
	Kuala Selangor	18,564	...	...	...	...	Tanjong Karong and Sekenchan—694 acres abandoned. Flowering commenced in Jeram. 4710 acres Cultivators are awaiting favourable conditions to transplant rest of the area.
		23,236	...	...	...	...	
Negri Sembilan	Seremban	4,904	...	...	...	...	One to three months old.
	Kuala Pilah	17,931	...	...	...	...	Planting and weeding in progress.
	Port Dickson	159	...	...	...	...	Transplanting completed.
	Jelebu	3,116	...	...	...	...	Flowering commenced.
	Tampin	2,609	...	...	...	...	Three months old.
	Rembau	7,897	...	...	...	...	Weeding.
		36,616	...	...	...	...	

SUMMARY OF PADI REPORTS, FEDERATED MALAY STATES, STRAITS SETTLEMENTS AND KEDAH FOR THE MONTH OF OCTOBER, 1930.—(Continued).

State or Settlement	District	Acreage of padi land	Acreage planted	Percentage 4 to 3	Gross crop	Crop per acre 6 to 4	Remarks
		Acres	Acres		Gantangs		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pahang	Temerloh	12,311	...	...	...	...	Flowering up to five months planted.
	Raub	5,112	...	...	...	...	Transplanting to four months planted.
	Kuala Lipis	8,450	...	...	...	...	River mukims five months old—Rest transplanting completed
	Bentong	1,100	...	...	...	...	Up to four months planted.
		26,973	...	...	...	...	
Straits Settlements	Malacca, Central	16,473	...	...	...	...	One to three months planted.
	Alor Gajah	11,136	...	...	...	...	One to two months old.
	Jasin	5,756	...	...	...	...	Transplanting in progress.
		33,365	...	...	...	...	
	P. Wellesley, North	18,560	...	...	...	...	Planted.
	Central	10,519	...	...	...	...	Planting in progress.
	South	4,643	...	...	...	...	Clearing still in progress and planting commenced
		33,728	...	...	...	...	
	Penang	4,000	...	...	...	...	Planting completed
	Singapore	nil	...	...	...	...	

SUMMARY OF PADI REPORTS, FEDERATED MALAY STATES, STRAITS SETTLEMENTS AND KEDAH FOR THE MONTH OF OCTOBER, 1930.—(Continued).

State	District	Acreage of padi land	Acreage planted	Percentage 4 to 3	Gross crop	Crop per acre 6 to 4	Remarks
		Acres	Acres		Gantangs		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Kedah	K. Star	105,060	...	...	...	...	
	Langkawi	4,908	...	...	...	...	
	Padang Terap	6,637	...	...	...	...	
	Kubang Pasu	35,094	...	...	.	...	
	Kuala Muda	13,267	...	...	...	...	Planting in progress.
	Baling and Sik	19,156	...	...	...	...	
	Kulim	3,642	...	...	...	...	
	Bandar Bahru	2,528	...	...	...	...	
	Yen	19,748	...	...	...	...	
		210,040	...	...	...	...	

N.B.—The figures given in the latest return under column 3 may be accepted as more accurate than any given in previous returns.

J. GORDON-CARRIE,
Statistician.

METEOROLOGICAL SUMMARY, MALAYA. OCTOBER, 1930.

Locality	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total		Most in a day: Amt.	Number of days: Precipitation*	Precipitation, 1mm. or more	Thunderstorm	Thunder heard	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total	Daily Mean	Per cent	Length of Day
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.							hr.	hr.	%	hr.
Railway Hill, Kuala Lumpur, Selangor ...	89.8	71.6	80.7	94	69	82	74	82.9	83.6	15.53	394.5	3.07	29	27	6	19	8		154.25	4.97	41	12.1
Bukit Jeram, Selangor ...	88.0	72.4	80.2	92	71	80	74	84.9	87.3	8.30	210.8	1.99	27	22	2	15	8		181.65	5.86	48	12.1
Sitiawan, Perak ...	88.5	72.9	80.7	92	71	85	75	84.2	84.6	8.62	218.9	2.56	24	20	12	17	2		195.10	6.29	...	...
Kroh, Perak ...	85.9	70.5	78.2	89	68	80	72	79.5	82.2	21.86	555.3	2.14	29	28	...	12	18	2	163.00	5.26	...	...
Temerloh, Pahang ...	89.2	72.7	80.9	92	71	81	74	84.6	86.0	24.23	615.5	8.60	22	19	3	23	5		179.80	5.80	48	12.1
Kuala Lipis, Pahang ...	88.9	71.6	80.3	91	69	82	74	83.5	84.4	11.35	288.3	2.47	25	19	13	17	20		172.75	5.57	...	...
Kuala Pahang, Pahang ...	85.5	73.7	79.6	89	70	78	76	84.4	86.8	13.06	331.7	4.11	24	20	3	9	...		198.30	6.40	53	12.1
Cameron's Highlands, Rhodendron Hill, Pahang ...	70.5	59.3	64.9	73	53	66	61	...	...	23.09	586.5	2.64	30	29	1	4	1		113.25	3.65	30	12.0
Cameron's Highlands Tanah Rata	71.2	57.2	64.2	74	54	68	61	69.8	69.8	23.93	607.8	2.84	30	29	1	10	1		119.95	3.87	32	12.0
Fraser's Hill, Pahang ...	73.1	61.7	67.4	77	60	70	63	71.0	71.4	20.05	509.3	2.03	29	29	...	20	17		146.75	4.73	39	12.0
Mount Faber, Singapore ...	87.5	74.2	80.9	92	71	77	76	82.2	83.6	9.24	234.7	3.01	18	13	2	17	...		164.30	5.30	44	12.1
Butterworth, Province Wellesley	86.5	73.7	80.1	89	73	83	75	84.1	84.8	15.01	381.3	3.68	27	25	...	22	...		197.80	6.38	...	...
Bukit China, Malacca ...	84.2	73.3	78.7	87	72	81	74	83.1	84.5	5.64	143.3	1.13	21	20	...	2	...		198.50	6.40	53	12.1
Kluang, Johore ...	87.6	71.2	79.4	91	68	80	74	81.0	82.0	18.03	458.0	3.08	27	25	2	15	19		151.10	4.87	40	12.1
Bukit Lalang, Mersing, Johore...	86.1	71.7	78.9	90	69	78	73	81.6	82.2	7.81	198.4	1.65	17	15	1	14	...		189.05	6.09	50	12.1
Alor Star, Kedah ...	87.4	73.7	80.5	93	71	81	76	85.8	86.0	16.90	429.3	3.17	27	23	...	11	...		202.65	[illegible]	...	...
Kota Bharu, Kelantan ...	86.5	73.6	80.1	89	72	79	76	84.6	85.5	8.85	224.8	3.18	22	18	...	9	...		182.00	5.87	...	...
Kuala Trengganu, Trengganu...	85.7	73.1	79.4	89	71	80	75	83.7	84.9	5.60	142.3	1.51	26	21	...	8	2		176.05	5.68	...	...

* Precipitation ·01 inch or more when measurement is in inches ·2mm. or more when measurement is in millimetres.

Compiled from Returns supplied by the Meteorological Branch, Malaya.

INDEX.

Vol. XVIII, 1930.

Original Articles are shown in heavy type.

A

	Page.
Advertising in the Malayan Agricultural Journal ...	529
Agricultural Conference. Kuala Lumpur ...	527. 562
,, Research ...	44
,, School. Malaya ...	120
,, ,, ,, . Prospectus ...	561
,, Shows. 1930. 252. 271. 313. 412/3. 417/8. 466/7.	510
Agriculture at Camerons Highlands. B. Bunting & J. N. Milsum ...	5
,, and Health Measures. Interdependence of— ...	373
,, in Labuan. W. N. Sands ...	178
Agrotis ypsilon ...	212
Alcohol production ...	305
Aleurocanthus woglumi ...	513
Aleurodicus destructor. Mask. ...	360
American Market for Tuba Root. R. C. Roark ...	445
Animal Husbandry in Malaya ...	322
Apanteles species ...	335
,, parasa. Rohw. ...	360
,, tirathabae. Wilk. ...	508
Areca Nuts. Remarks on Crops.	258. 364. 415
Artona catoxantha. Hamps. ...	512
Ascomycetes species ...	204
Attempt to Control Padi Borers. N. C. E. Miller & H. T. Pagden ...	334
Avocado Seedlings. Budding— ...	461
Azotobacter ...	300

B

Bacterium Solanacearum ...	69
Baled Copra. C. D. V. Georgi & F. C. Cooke ...	281
Banana Cultivation. Lecture on— ...	218
,, Diseases ...	62
,, **Flour. The Manufacture of—F. S. Ward** ...	138
,, **Growing in Malaya and the Presence of Diseases. F. S. Ward**	63
,, Investigations on Panama Disease in Malaya. F. S. Ward.	509
,, Remarks on Crops ...	54

	PAGE.
Biological Control of Insect and Plant Pests. W. R. Thompson. ...	558
Brachytrupes portentosus. Licht. ...	212
Brazil Nut in Malaya. J. Lambourne. ...	309
British Industries Fair 1930. Malaya at the— ...	357
Budding Avocado Seedlings ...	461
Buffalo. Malayan. R. Macgregor ...	90
Bulletins. Special— ...	582
Burma Agricultural Reports ...	165

C

Calopogonium mucunoides ...	380. 492
Cameron Highlands ...	1. 20
,, ,, **Agriculture at. B. Bunting & J. N. Milsum** ...	5
,, ,, **The Soils at. J. H. Dennett** ...	20
Cardamoms ...	16
Cattle, Friesian. T. D. Marsh ...	326
Ceiba pentandra ...	278
Centrosema pubescens ...	492. 380
Cephaleuros mycoidea ...	275
Cephonodes hylas	212. 482. 488
Cercospora species ...	598
Ceylon Department of Agriculture.	
Extensional Work in Ceylon. ...	4
Technical Reports and Reports of the Divisional Officers for 1928.	50
Chemistry and Plant Diseases ...	95
Chillies. Remarks on Crops ...	114
Chinese Hatcheries. J. Fairweather ...	341
,, Medicine. Drugs of Chinese Pharmacies in Malaya. D. Hooper. ...	210
Chrysopogon aciculatus ...	179
Cicada species ...	214
Cinchona ...	18
,, in the British Empire ...	92
,, Ledgeriana ...	92
Cinema Films and Agricultural Propaganda ...	324
Clostridium ...	300
Cloves ...	516. 625
Coccus virides. Green. ...	164
Coconuts ...	61
,, . **Baled Copra. C. D. V. Georgi & F. C. Cooke** ...	281
,, . **Copra. Review of the—Market. October 1929. D. H. Grist** ...	78

	PAGE.
Coconuts	
,, . **Cultivation in Ceylon. B. Bunting** ...	375
.. . Entomological Notes ...	213
,, . Future of— ...	580
.. . Historical Note on Tirathaba rufivena, Walk. and its three Parasites in Malaya. G. H. Corbett. ...	508
,, . **Improvement of the Coconut Crop by Selection. H. W. Jack** ...	30
,, . Marketing Problems of Coconut Growers ...	402
,, **on Peat. F. C. Cooke** ...	587
,, . Remarks on Crops. 258. 364. 414.	468
,, **Research in Malaya. A. Sharples** ...	71
,, Research Work on—Palms ...	2
,, Wilt Diseases of—Palms in Trinidad ...	202
,, **The World's Coconut Crop. F. C. Cooke** ...	343
Coffee ... 15.	479
,, . arabica ...	483
,, . canephora ...	483
,, . **Cultivation of Coffee in Malaya. B. Bunting & J. N. Milsum** ...	481
,, . Cultivation. Soil Management ...	205
,, . Entomological Notes ...	212
,, . excelsa ...	483
,, . liberica ...	482
,, Market in 1929 ...	157
.. . Note on Thread Blight of Coffee ...	618
,, . Quillou ...	483
,, . Remarks on Crops. 115. 168. 311. 364. 414.	468
,, . Robusta ... 482.	483
,, ,, . Selection of Robusta Coffee ...	459
,, . Scale Insects of Coffee ...	164
,, . A Note on Thread Blight of Coffee. A. Thompson. ...	621
,, . Uganda ...	483
Colombian Pita Fibre ...	119
Co-operation ...	174
,, . Progress of—in Malaya ...	507
Co-operative Marketing by Smallholders ...	200
,, **Rubber Societies amongst Small-holders. F. G. Spring**	192
,, Societies. Conference of Delegates ...	264
Corticium salmonicolor ...	488
Cosmopolites sordidus ...	70
Cover Crops and Soil Moisture ...	479
,, . **The effect of Cover Crops on Soil Moisture. W. N. C. Belgrave** ...	491

PAGE.

Crabs in Padi Fields ... 568
Crotalaria anagyroides 214. 380. 487
„ juncea ... 46
Cryphalus hampei. Ferr. 212. 488. 511
Cryptorhynchus mangiferae. E. ... 182
Cultivation of Coffee in Malaya. B. Bunting & J. N. Milsum ... 481
Cultivation of Pineapples. D. H. Grist ... 242
Cultivation of Wet Rice under Irrigation in Australia. J. W. Jolly 397
Culture of Vegetables in Malaya. B. Bunting & J. N. Milsum. ... 209

D

Demonstration Station. 54. 115. 168. 218. 258. 311. 365. 415. 469. 516. 573. 626
Departmental Notes.
Agricultural Advisory Committee ... 110. 471
Annual Report ... 411
Appointments 57. 472. 627
Coconut and Oilpalm Research Committee ... 111
Conference of Co-operative Societies Delegates ... 264
„ Departmental and Inter-Departmental Agricultural Conference. 1930. ... 518. 573
„ of Field Officers. 1929 ... 56
Demonstrations at the Experiment Plantation Serdang. 314. 368. 418. 518. 573
Departmental Exhibits at Agricultural Shows ... 417
Discussions regarding Jelutong ... 417
Experimental Work at Serdang ... 169
Honour for Dr. H. W. Jack ... 314
Leave 57. 112. 170. 216. 263. 368. 472. 519. 573. 627
7th Malayan Exhibition. 1930. ... 260
School of Agriculture. Laying of Foundation Stone. ... 215
Statistical Division ... 111
Transfer of Mr. W. N. Sands to Kedah ... 418
Vernacular Publications ... 215. 519
Visit of Agricultural Chemist to New York 263. 368. 417
„ „ Assistant Agriculturist to India and Ceylon ... 263. 627
„ „ Director of Agriculture to Malacca ... 518
„ „ „ „ Pahang and Johore ... 627
„ „ Delegation of Rice Production Committee to the Northern Rice Areas. ... 518
„ „ H. E. the Governor to Serdang ... 518
„ „ Dr. (Miss) Müller to Malaya ... 627

PAGE.

Visit of H. H. the Regent of Kedah to Serdang ... 573
" " H. R. H. Prince Purachatra of Siam ... 518
" " Mr. C. O. Oates to Malaya ... 573
" " Mr. H. J. Page to Malaya. ... 627
" " Mr. C. F. Pemberton to Malaya ... 627
Derris elliptica 17. 114. 310. 426. 462. 469. 516. 541
Derris. The American Market for Tuba Root. R. C. Roark ... 455
" **A Major Pest of Tuba. N. C. E. Miller** ... 541
Diatraea auricilia. Dudg. 290/1. 334/7. 362
" saccharalis. Fab. ... 337
Dolichos Hosei ... 380
Drugs of Chinese Pharmacies in Malaya. D. Hooper. ... 210
Dryinid species ... 238

E

Economics of the Rice Situation. H. A. Tempany ... 229
Editorial 1. 60. 118. 174. 226. 271. 322. 373. 425. 478. 527. 580
Effect of Cover Crops on Soil Moisture. W. N. C. Belgrave ... 492
Elaeis guineensis Jacq. see Oilpalms
" Poissoni. E. Annet " "
" " . Sundry varieties ... 556
Elytranthe species ... 182
Entomological Notes 212. 359. 511
Epicauta ruficeps. Ill. ... 359
Erionata thrax. L. ... 69
Erycia basifulva. Bezzi. ... 508
Erythrina indica ... 278
" lithosperma ... 278. 389
" species ... 486
Estimate of Production and Consumption of Crude Rubber during the year 1930. ... 208
Eublemma rubra. Hamps. ... 164
Exhibition for Tourists. Malacca ... 218
Export Crops of the Netherlands East Indies in 1929. ... 612
Extensional Work in Ceylon ... 4

F

Fagraea crassipes ... 178
Ferrisia virgatus. Ckll. ... 164
Field Division of the Department of Agriculture ... 3
Film Propaganda ... 62. 324

PAGE.

Film Propaganda in relation to the Departments of Agriculture and Co-operation, J. Corrie ... 87
Fomes applanatus. Pers. ... 185
„ lamaoensis. Murr. 185. 186. 187
„ lignosus. Klotzsch. ... 185
Food Crops. Remarks on Crops 218. 258. 515. 572. 625
Friesian Cattle. F. D. Marsh ... 326
From the Districts 53. 113. 167. 217. 257. 310. 363. 414. 468. 514. 572. 625
Fruit at Cameron's Highlands ... 17
Fruit. Remark on Crops 168. 218. 258. 311. 365. 415. 469. 515. 625
„ Seedling Fruit-Stocks. ... 255
„ Transport of fresh fruit by sea ... 350
Fusarium cubense ... 68. 509

G

Gambier, Remarks on Crops. ... 469
Ganoderma applanatum ... 185
„ lucidum (Leyss.) Kart. ... 184. 187
„ tumidum. Bres. ... 184
Gliricidia maculata ... 486
Gold Coast. Year book 1928 of the Department of Agriculture ... 109
Government Dairy. Colombo Ceylon. B. Bunting ... 600
Granaries, Municipal, Colombo, Ceylon. B. Bunting ... 545

H

Hatcheries, Chinese. J. Fairweather ... 341
Helopeltis species ... 212
Hemileia vastatrix ... 484. 488
Hibiscus mutabilis. L. ... 543
Home Gardens ... 470
Hymenachne myuros ... 362

I

Imperata arundinacea ... 178
Imperial Agricultural Bureaux ... 98
Imperial Agricultural Research Conference 1927. ... 44
Improvement of the Coconut Crop by Selection. H. W. Jack ... 30
Indogofera endecaphylla ... 315
Insect Pests of Padi in Malaya. N. C. E. Miller & H. T. Pagden ... 289
Interdependence of Agriculture and Health Measures ... 373

	Page.
International Congress of Tropical Agriculture. Antwerp 1930. ...	211
International Directory of Pedigree Stock Breeders ...	624
International Maritime and Colonial Exhibition 1930—	
Malayan Agriculture at the— ...	464

J

Jelutong ...	115

K

Kenya. Report of the Agricultural Commission in the Colony and Protectorate of— ...	253

L

Labuan, Agriculture in. W. N. Sands ...	178
Lecanium viride ...	488
Lectures 169. 218. 229. 259.	263
Leptocorisa acuta ...	289
Leptomastix trilongifasciatus. Girault. ...	164
Live Stock ...	218
Locusta migratoroides. Rch & F. ...	359
Locusts 273. 367.	416
Loranthus species ...	182
Lutra leptonyx. Horsf. ...	568

M

Major Pest of Derris. Neolepta Biplagiata. N. C. E. Miller ...	541
Malaria. Silt-pitting on Estates in Relation to Mosquito breeding and Malaria ...	376
Malaya at the British Industries Fair 1930 ...	357
Malaya, Rainfall of. C. D. Stewart ...	530
Malayan Agricultural Journal ...	1. 581
Malayan Buffalo. R. Macgregor ...	90
Malayan Exhibition 1930 ...	52
Malayan Information Agency. Report on the Administration of the—	410
Malayan Oilpalm Industry in 1929. D. H. Grist ...	347
Malayan Pineapple Industry. D. H. Grist ...	188
Manihot utilissima. Pohl. ...	183
Manufacture of Banana Flour. F. S. Ward ...	138
Manuring of Rubber. W. B. Haines ...	232
Marasmius palmivorus 72. 204.	262

PAGE.

Market Prices 58. 116. 171. 220. 265. 316. 369. 420. 473. 520. 574. 628
Market Problems of Coconut Growers ... 402
Mechanised Rice Cultivation in Southern Siam.
H. A. Tempany, H. W. Jack & W. N. Sands ... 583
Melastoma polyanthum ... 178
Message to the Malayan Agricultural Journal from H. E. Sir Cecil Clementi, K.C.M.G. ... 224
Meterological Summary January 1930 ... 222
„ „ February „ ... 223
„ „ March „ ... 270
„ „ April „ ... 321
„ „ May „ ... 372
„ „ June „ ... 424
„ „ July „ ... 477
„ „ August „ ... 526
„ „ September „ ... 579
„ „ October „ ... 633
Metroxylon sagus. Rothb. ... 183
Mikania scandens ... 492
Mildew Disease of Hevea. F. Beeley ... 596
Morinda tinctoria ... 278
Municipal Granaries. Colombo. B. Bunting ... 545
Musa Cavendishii ... 509
„ malaccensis ... 509
„ violescens ... 509

N

Nemeritis palmaris. Wilk. ... 508
Neolepta biplagiata ... 512. 541
Nisotra species ... 310
Nutmegs ... 516
Nymphula depunctalis ... 291

O

Obituary. Mr. L. C. Brown ... 358
„ . Sir Francis Watts. K.C.M.G. ... 571
Oidium Heveae 306. 396. 514
Oil palm. Entomological Notes ... 213
„ . Fruits and Oils of Oilpalm varieties ... 607
„ Industry ... 480

	Page.
Oil palm. **Malayan Oil palm Industry in 1929. D. H. Grist** ...	347
,, . Notes on—in Angola ...	556
,, . **The Palm oil Factory at Elaeis Estate, Johore** ...	497
,, . Position of the Industry ...	325
,, . Remarks on Crops ...	310
,, . Stem-Rot of Oil palms ...	177. 184
Organisation and Work of the Department of Agriculture ...	226
Ornamental Plants at Cameron's Highlands ...	18
Orthezia insignis. Dougl. ...	362
Oryctes rhinoceros	71. 179. 359. 383
Oryza latifolia ...	362

P

Pachyteria virescens. Pasc. ...	362
Padi. see Rice	
Palm oil Factory at Elaeis Estate, Johore ...	497
Parasa lepida. Cram.	261. 360. 383
Paratelphusa sexpunctatum. Lancaster. ...	568
Peat. **Coconuts on—F. C. Cooke** ...	587
Peat as a Fertiliser. R. A. Alston ...	299
Pepper ...	272
Pepper in Malaya. J. N. Milsum. ...	274
Pestalozzia palmarum ...	204
Phanurus beneficiens. Zehnt. ...	337
Phytophthora palmivora. Butl. ...	202
Pineapple Bran ...	557
Pineapple Canning. D. H. Grist ...	293
,, **Cultivation. D. H. Grist** ...	228. 242
,, . Experimental Consignments of— ...	106
,, . Fresh—from Surinam ...	351
,, **Industry in Malaya. D. H. Grist** ...	188
,, . Malayan— ...	60
,, . Remarks on Crops.	217. 258. 311. 365. 415. 469. 625
Pita. Colombian—Fibre. ...	119
Plant Diseases. Chemistry and— ...	95
,, Distributions.	312. 367. 416. 469. 516
Plesispa reichei ...	71
Prays citri. Mill. ...	182
Prays endocarpa. May. ...	182
Preliminary Observations on Sogata species. Pests of Padi. N. C. E. Miller & H. T. Pagden ...	238
Preparation and Work of Rural School Teachers in Malaya. O. T. Dussek ...	247

PAGE.

Principles of Tropical Agriculture. H. A. Tempany & G. E. Mann. ... 354
Production of Whale Oil ... 622
Pseudococcus citri. Risso. ... 164
,, crotonis ... 164
,, lilacinus. Ckll. ... 164
Pseudomonas celebensis ... 69
,, musae ... 69. 509

R

Rainfall of Malaya. C. D. Stewart ... 528. 530
Rats 168. 219. 259. 313. 367. 416. 470. 517. 573. 626
Recent Field Observations on Rubber. F. W. South ... 391
Rejuvenation and Replanting of Rubber Areas. B. J. Eaton ... 151
Report on the Administration of the Malayan Information Agency. ... 410
Report of the Agricultural Commission in the Colony and Protectorate of Kenya. ... 253
Review of the Copra Market. October 1929. D. H. Grist ... 78
Review of the F.M.S. Statistics relating to Rubber Production. J. Gordon-Carrie ... 49
Review of the present position of Rice Production in Malaya. W. N. Sands ... 130
Reviews of current literature. List of, see page 12 of Index.
Rhynchophorus ferrugineus ... 383
,, schach. Oliv. 71. 179. 359. 511
Rice. Attempt to Control Padi Borers. N. C. E. Milier & H. T. Pagden ... 334
Rice. Committee for the Extension of the Cultivation of Rice in Malaya. ... 419
Rice. **Crabs in Padi Fields. W. N. Sands** ... 568
Rice Cultivation. Improvement of Rice Cultivation in Malaya, Indo-China and Java. ... 159
Rice Cultivation. **Mechanised Rice Cultivation in Southern Siam. H. A. Tempany, H. W. Jack & W. N. Sands** ... 583
Rice Cultivation. **Cultivation of Wet Rice under Irrigation in Australia. J. W. Jolly** ... 397
Rice, Economics of the—Situation. H. A. Tempany ... 229
Rice. Entomological Notes ... 213
Rice Estates ... 580
Rice. Improvement of Rice Cultivation in Malaya, Indo-China and Java. ... 159
Rice. **Insect Pests of Padi in Malaya. N. C. E. Miller & H. T. Pagden** ... 272. 289
Rice. Large Scale Padi Planting ... 374

PAGE.

Rice. Manurial Experiments ... 46
Rice. **Mechanised Rice Cultivation in Southern Siam. H. A. Tempany, H. W. Jack and W. N. Sands** ... 583
Rice. **Municipal Granaries. Colombo. B. Bunting** ... 545
Rice. Padi-Borers. **An attempt to control Padi-Borers. N. C. E. Miller & H. T. Pagden** ... 334
Rice. Padi Experiments 1929—1930 ... 502
Rice. Padi Planting. Large Scale Padi Planting ... 374
Rice. Padi Reports. 173. 267. 268 319. 371. 422. 475. 524. 577. 630
Rice. Padi Test Plots 54. 168. 218. 258. 312. 366. 415. 469. 516. 573. 626
Rice. **Preliminary Observations on Sogata species, Pests of Padi. N. C. E. Miller and H. T. Pagden** ... 238. 508
Rice. Preliminary Account of 3 Rice Stem Borers. H. T. Pagden. ... 410
Rice Production. **Review of the present position of Rice Production in Malaya. W. N. Sands** ... 130
Rice Remarks on Crops. 53. 113. 167. 217. 257. 310. 363. 414. 468. 514. 572. 625
Rice Situation 118. 130. 215. 229
Rice Storage Experiments. H. W. Jack and R. B. Jagoe ... 447
Rice. Storage of Grain ... 425
Rice Storage. **The Municipal Granaries. Colombo. B. Bunting** ... 545
Rigidoporus microporus. van Overeem. ... 185
Rinderpest. R. MacGregor ... 197
Role of Vitamins in Stock Feeding. J. B. Orr ... 551
Rotan Sega. Remarks on Crops ... 415
Rubber Accounts. A Guide to Rubber Estates Bookkeeping and Accounts. E. D. Butler. ... 463
Rubber. Annual Report of the R.R.I. for 1929 ... 355
Rubber Area. Return of Area newly planted with Rubber in the F.M.S. during 1929. ... 317
Rubber. **Co-operative Societies amongst Small-holders. F. G. Spring** 192
Rubber. Estimate of Production and Consumption of Crude Rubber during the year 1930. ... 208
Rubber. Improvement of Yield in Hevea Brasiliensis. F. Summers. 353
Rubber. Information Cards for Rubber Estate Factories ... 620
Rubber. Manuring of— ... 227. 232
Rubber Market in 1929 ... 156
Rubber. **Mildew Disease of Hevea. F. Beeley** ... 596
Rubber. Native Rubber Cultivation in the Netherlands East Indies ... 609
Rubber Production. Estimate of Production and Consumption of Crude Rubber during 1930. ... 208
Rubber Production. **Review of F.M.S. Statistics relating to Rubber Production. J. Gordon-Carrie** ... 40

PAGE.

Rubber. **Recent Field Observations. F. W. South** ... 391
Rubber. **Rejuvenation and Replanting of Rubber Areas. B. J. Eaton** 151
Rubber. **Silt Pitting on—Estates in Relation to Mosquito Breeding and Malaria** ... 376
Rubber. Remarks on Crops. 53. 113. 167. 217. 257. 310. 363. 414. 468. 514. 572. 625
Rubber Research Institute. Annual Report for 1929. ... 355
Rubber. Return of Area newly planted with Rubber in the F.M.S. during 1929. ... 317
Rubber, Secondary Leaf-Fall ... 273. 306
Rubber Statistics. 3. 40. 117. 221. 266. 317/18. 370. 421. 474. 478. 521/23. 576. 629
Rubber Trade. A Survey of the Trade in Rubber Manufactured Goods. ... 404
Rubber Trade. The World's Trade in Rubber ... 375
Rubber Trade. World Trade in Scrap and Reclaimed Rubber ... 48
Rubber Yields. Improvement of Yield in Hevea Brasiliensis. F. Summers ... 353
Rural School Teachers in Malaya. The preparation and Work of— ... 247

S

Sacciolepis myosuroides ... 362
Saissetia haemisphericum. Farg. ... 164
Scale Insects of Coffee ... 164
Schoenobius incertellus 290/91. 334/37
School of Agriculture, Malaya. G. E. Mann ... 146
School Gardens 55. 219. 259. 313. 367. 416
Scirpophaga auriflua. Z. ... 336
Scotinophara coarctata 289. 292. 515
Second Inter-Departmental Agricultural Conference. Kuala Lumpur 527. 562
Secondary Leaf-fall of Rubber. ... 306
Seedling Fruit Stocks. H. B. Tukey. ... 255
Selection of Robusta Coffee ... 459
Serious Stem Rot of Oil Palms. A. Sharples and L. P. Jorgensen ... 181
Sesamia inferens 290/91. 334/36. 362
Setaria rubiginosa ... 362
Setora nitens ... 213. 261
Silt pitting on Rubber Estates in Relation to Mosquito Breeding and Malaria 376
Sisal ... 311
Sisal. Production and Preparation. H. H. Smith. ... 163
Sisal Waste for Alcohol Production, Utilisation of. V. R. Greenstreet ... 305

Sitotroga cerealella. Oliv. 337/38. 362
Sogata distincta. Dist. ... 239. 289
„ furcifera. Horv. ... 239
„ pallescens. Dist. ... 239. 289
„ **species. Observation on—Pests of Padi. N. C. E. Miller and H. T. Pagden** ... 238
Soil Management particularly with reference to Coffee Cultivation ... 205
Soil Moisture, Effect of Cover Crops on. W. N. C. Belgrave ... 492
Soils at Cameron's Highlands. J. H. Dennett ... 20
Spalgis epius. Walk. ... 164
Special Bulletins ... 582
Spodoptera mauritia. Boisd. 292. 362. 512. 514
„ pecten ... 292
Stauropus lichenina. Butl. ... 361
Stem-rot of Oil-palm. A. Sharples and L. P. Jorgensen ... 184
Stephanoderes hampei ... 360
Stock Breeders, International Directory of Pedigrees ... 624
Stock Feeding. **The Role of Vitamins in—J. B. Orr** ... 551
Storage of Grain. 425. 447. 545
Sycanus Leucomesus. Walk. ... 213. 544

T

Tapioca. Remarks on Crops ... 258
Tea ... 2. 10. 426
Tea Cultivation and Manufacture in Ceylon. B. Bunting ... 428
Tea. Entomological Notes ... 212
Tea Experiments. J. N. Milsum ... 121
Tea Market in 1929 ... 157
Tea. Remarks on Crops 54. 114. 217. 311. 515
Technical Reports. 1929. ... 527
Tephrosia candida 214. 380. 485. 487
Termite-proof Construction of Buildings in Ceylon. F. P. Jepson. ... 108
Tetroda histeroides ... 289
Third Imperial Entomological Conference. London. June 1930. ... 505
Thread Blight of Coffee, Note on—A. Thompson. ... 621
Tirathaba rufivenia. Walk. 71. 213. 261. 508
Tithonia diversifolia ... 46
Tobacco Cultivation in Kedah. W. N. Sands ... 605
Tobacco. Remarks on Crops ... 469. 515
Transport of Fresh Fruit by Sea ... 350
Trichogramma minutum. Riley. ... 337/39
„ nanum. Zehnt. 213. 337/39. 362. 512

PAGE.

Tropical Agriculture. International Congress. Antwerp 1930. ... 211
Tropical Agriculture. Principles of—H. A. Tempany & G. E. Mann. 354
Tropical Crops. O. W. Barrett. ... 51
Tuba. See Derris elliptica ...

U

Utilisation of Sisal Waste for Production of Alcohol.
V. R. Greenstreet ... 305

V

Vegetables at Cameron's Highlands ... 18
„ Culture of Vegetables in Malaya. B. Bunting and J. N. Milsum. ... 209
Vernacular Publications ... 427
Vitamins. The Role of Vitamins in Stock Feeding. J. B. Orr ... 551

W

Whale Oil. Production of— ... 622
Wilt Diseases of Coconut Palms in Trinidad ... 202
World's Coconut Crop. F. C. Cooke ... 343
World's Trade in Rubber ... 375
World's Trade in Scrap and Reclaimed Rubber ... 48
Wormia Burbidgei ... 178

REVIEWS.

	PAGE.
Technical Reports and Reports of Divisional Agricultural Officers of the Ceylon Department of Agriculture for 1928. ...	50
The Tropical Crops. O. W. Barrett. ...	51
The Termite-proof Construction of Buildings in Ceylon. F. P. Jepson.	103
Yearbook 1928. Department of Agriculture Gold Coast ...	108
Sisal. Production and Preparation. H. H. Smith. ...	163
Scale Insects of Coffee. H. Begemann ...	164
Burma Agricultural Reports for the nine months ending 31st March 1929 ...	165
The Culture of Vegetables in Malaya. B. Bunting & J. N. Milsum. ...	209
On Chinese Medicine. Drugs of Chinese Pharmacies in Malaya. D. Hooper. ...	210
The Report of the Agricultural Commission in the Colony and Protectorate of Kenya. ...	253
Seedling Fruit Stocks. H. B. Tukey. ...	255
The Brazil Nut in Malaya. J. Lambourne. ...	309
The Improvement of Yield in Hevea Brasiliensis. F. Summers ...	353
Principles of Tropical Agriculture. H. A. Tempany & G. E. Mann ...	354
Annual Report of The Rubber Research Institute of Malaya for the year 1929. ...	355
A Preliminary Account of three Rice Stem-Borers. H. T. Pagden ...	410
Report on the Administration of the Malayan Information Agency for the year 1929. ...	410
Annual Report of the Department of Agriculture S.S. and F.M.S. for the year 1929. ...	411
A Guide to Rubber Estates Bookkeeping and Accounts. E. D. Butler.	463
Progress of Co-operation in Malaya ...	507
An Historical Note on Tirathaba Rufivena. Walk. (The Greater Coconut Spike Moth) and its three Parasites in Malaya. G. H. Corbett. ...	508
Preliminary Observations on Sogata species. Pests of Padi. N. C. E. Miller & H. T. Pagden. ...	508
Investigations on Panama Disease in Malaya. F. S. Ward. ...	509
The Biological Control of Insect and Plant Pests. W. R. Thompson.	558
Prospectus of the Government School of Agriculture, Malaya. ...	561
The Export Crops of the Netherlands East Indies in 1929. ...	612